The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

ol. XXV] 1946-47 [No. 3

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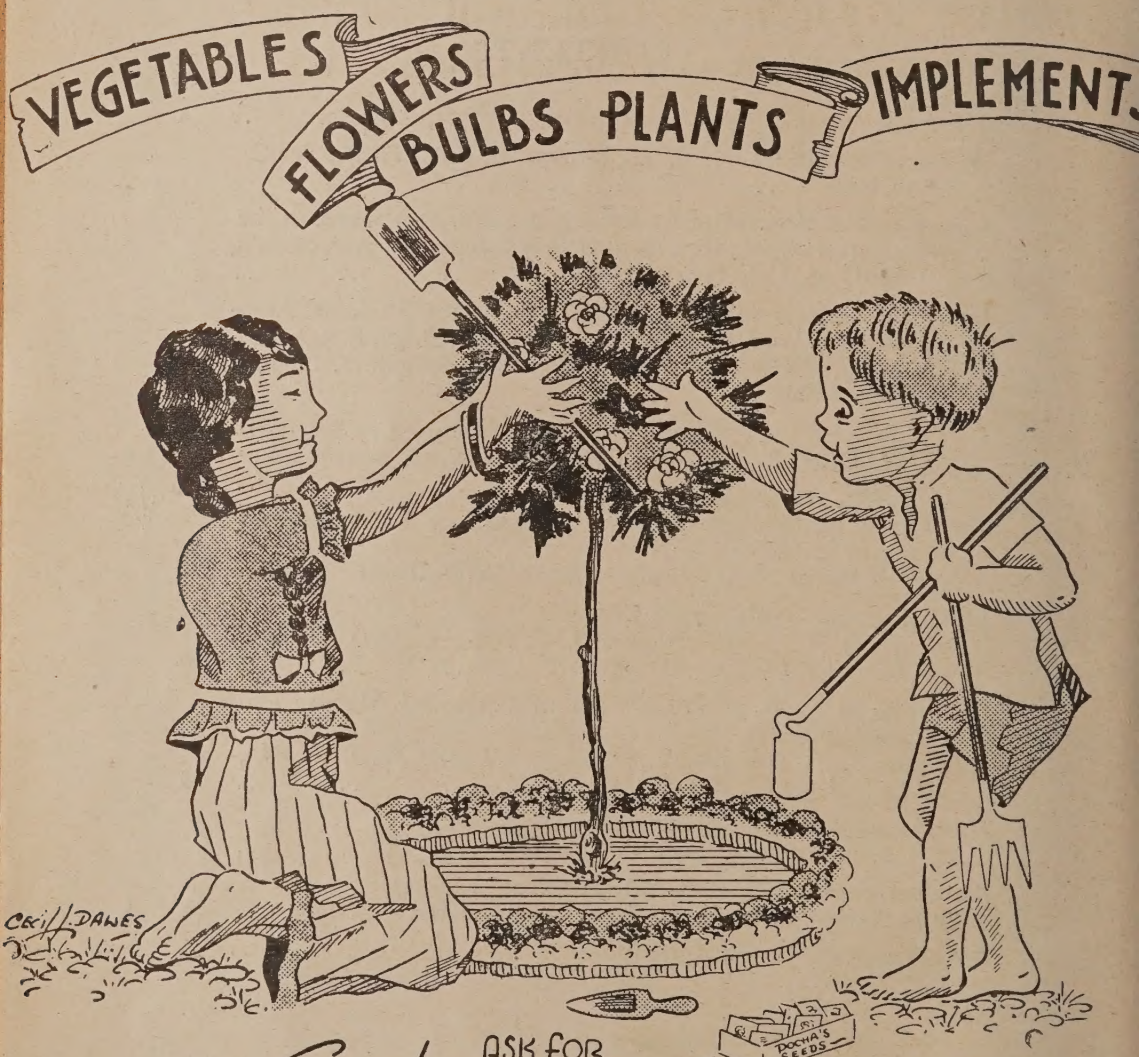

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The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XXV] 1946—47 [No. 3

The Agricultural Students' Association, Hebbal, Bangalore

An Agricultural Students' Association, composed of the students of the Agricultural College and the Agricultural School, Hebbal, Bangalore, was inaugurated by L. Siddappa, Esqr., B.A., LL.B., Minister for Agriculture and Public Works, in Mysore, on 15th February 1947. Sir Jnan Chandra Ghosh, Director, Indian Institute of Science, Bangalore, delivered the Inaugural Address.

Welcome Speech by Dr. B. T. Narayanan, B.A., Ph.D., D.I.C., Principal

MR. PRESIDENT, SIR JNAN CHANDRA GHOSH, AND GENTLEMEN,

It is my privilege this evening, on behalf of my young friends, the members of the Agricultural Students' Association, my colleagues on the staff and myself, to extend to you all a very warm welcome into our midst and to express our grateful appreciation of the honour you have done us in coming here so far out of your way, possibly at some personal inconvenience and discomfort.

To you, Sir, and to you, Sir Jnan Chandra Ghosh, we are doubly indebted.

The presence of you all to-day is, we feel, a practical expression of your interest in our welfare and progress and an encouraging sign of the increasing recognition of the all-pervading importance of the science of Agriculture—that erstwhile Cinderella of all professions—, in our national economy.

The Agricultural Students' Association, like similar organizations, deals mainly with the extra-curricular activities of the College and School and caters to the creature comforts, and the bodily and mental recreation of the students. It has however a significant feature in its make-up not usually found in other similar bodies in that the College and the School are residential institutions

and the functions of the Association are therefore closely integrated with and complementary to the curricular programme.

The activities of the Association include the efficient management of a hostel, the organization of sports for carefree enjoyment, the maintenance of a reading room for mental recreation and the holding of lectures, debates and addresses for intellectual instruction. The management is vested largely in the student body occasionally assisted by and with complete co-operation from the concerned official element; and thus has its object in developing early a sense of responsibility, a capacity for organization, a spirit of helpful compromise and above all that spirit of selfless service which the profession of Agriculture demands of all its votaries. The Association has the advantage of being composed of students of both the newly started College and an established school with well-formed traditions, laying a foundation for the formation of lasting friendships and the cultivation of a spirit of understanding tolerance between future fellow-workers in the field. The lessons that are taught in the class-room are consolidated and the friendships formed therein are cemented in the wider arena of the playing field, the hostel and the reading room.

We are aware that to achieve these aspirations there is much yet to be done and a long arduous path to travel. Many amenities which our sister institutions provide for their members have yet to be provided. We have the excuse of all new-born and require to be fostered, nourished and cherished. Nevertheless, with the active sympathy of our benign Government and the public, we look forward to have shortened the course and remedied the wants you notice to-day.

I, for one, cannot conceive of more auspicious and encouraging circumstances under which an Association of this kind can be inaugurated than those obtaining to-day; that you, Sir, whose interest in and helpful sympathy for the uplift and well-being of the agriculturist has long been an article of faith, and under whose stimulating guidance the activities of the Department of Agriculture are now being furthered, should honour the Association by inaugurating it, and that you, Sir Jnan Chandra Ghosh, whose reputation for the practical application of scientific knowledge for the betterment of the general mass is internationally known, should have agreed to launch the Association on its way are, I feel, a rare privilege of which many of our elders might justly envy us. Elated as we are, we are humbly conscious of the responsibility this privileged occasion demands of us in the shaping of our future career. We hope, when you come again—and may that be often—that our development and progress are not unworthy of the honour you have done us to-day.

I now beg to invite you, Sir, to inaugurate the Association and to invite Sir Jnan Chandra Ghosh to deliver his Address to which we look forward.

Speech by the Hon. Minister for Agriculture, in Mysore, at the Inauguration of the Agricultural Students' Association, Hebbal, on 15th February 1947.

PRESIDENT AND MEMBERS OF THE AGRICULTURAL STUDENTS' ASSOCIATION, SIR J. C. GHOSH AND GENTLEMEN,

It gives me great pleasure to be here this evening and to inaugurate the newly formed Agricultural Students' Association. I congratulate the students of the Agricultural School and the Agricultural College on their having formed themselves into an organization so soon after the starting of the new College. The need for such an organisation cannot be over-stressed. It brings the students of all grades of both the institutions together and helps to foster in them a spirit of brotherhood. I am sure that the extra-curricular activities envisaged in their programme will help the development of their physique and intellect. One thing that greatly impresses me is that the management of the Hostel and connected activities are left to the students themselves under the guidance of the members of the staff. This spirit of self-help will be an asset to students in their after-life to be self-reliant to manage affairs entrusted to them.

You have, in your welcome speech, Mr. Principal, referred to my interest in and sympathy for the uplift and well-being of the agriculturist. I claim that I have been taking more than passing interest in their betterment. I belong to a community whose main profession is the practice of agriculture. I come of a family whose only profession is agriculture. I was born and bred in a village in a remote corner of the State where more than 90% of the population directly or indirectly live on agriculture. I have known the poignance of the poor and indigent conditions in which they eke out their livelihood. It is a well-known fact that in spite of what the Government have done to improve their condition, there has not been any appreciable improvement. It is rightly said that an average Indian farmer labours not for profit, not for a net return, but for a mere subsistence. More often than not, even this slender subsistence he fails to get in return for his arduous labour. The agriculturist is very often blamed for being conservative and not responding to the advice and help rendered by the Department. He is accused of not readily taking up to improved methods of cultivation by using improved implements, not using improved strains of seed and not applying proper manure in required quantities, with the result that the production on his farm is miserably low, and he continues to be steeped in debts. I agree that he is ignorant and conservative and not readily responsive to the advice given by experts of the Department.

The reasons for this state of affairs are many and deep-rooted. It is for this very reason that we have to think of a new approach to him. While we accuse the ryot of his ignorance, illiteracy and conservatism for which state of affairs he is not wholly responsible, there is a charge against the Department, I mean the Agricultural Department, of not coming into frequent contact with the rural population, of not taking the results achieved in the laboratory and on the farms, to the doors of the agriculturists. While in some cases our experts have done very well in the laboratories and on the farms, those responsible for propaganda and demonstration have either failed or have not come up to the required standard. It is my firm belief that unless better propaganda methods on a vast scale are adopted and demonstration carried on on a wider scale than what it is, there are very little chances of our agriculturists taking to improved methods.

To take a simple instance of preparing compost manure out of agricultural waste, I have seen demonstration pits dug and the method of preparing the manure explained to visitors in the Agricultural Section of the Dasara Exhibition and also in District Headquarter towns during the District Conferences. But how many of those that have visited the Exhibition have on their return to the villages taken up the preparation of the manure on the lines indicated to them ? After years of experience we have found that that method of demonstration and propaganda has not produced any concrete results. It is, therefore, very necessary that we change the technique and the *modus operandi*. It is necessary that the Agricultural Inspectors and the Fieldmen attached to taluks seek the assistance of the District Development Officer and through him the assistance of the local Revenue Officers and Gramasudharakas and arrange to dig pits in a prescribed number of villages, according to a plan drawn up for the purpose and advise the ryots of the entire village to prepare good manure. They must, by frequent visits to the villages, see that any one who gives up the attempt is induced to take to it once again and continue the same until the end of the season. If, after using the manure thus prepared, the ryot gets a better crop yield and an increased income, I assure you that he will never require further advice or inducement. To take another instance, I was touring in the latter part of the last official year in the villages served by the Rural Welfare Centre, Closepet. I found that an allotment of Rs. 750 earmarked for a certain purpose was not likely to be spent. I instructed the management to utilise the amount for giving 25% subsidy to the ryots who purchase improved ploughs by taking the ploughs to their doors. I further asked them to send me a report of action taken. You will be surprised to note that within a week I got a report that the entire grant was spent and that there was demand for some more grant. I am not unaware of the various handicaps under which the Department has

been suffering for want of adequate staff. Government have recently passed orders on the proposals of the Director for posting an Agricultural Inspector in charge of each taluk and Fieldmen in charge of important Hoblis. I assure you that Government, on their part, are always prepared to assist the agriculturist to improve his material condition. It is the desire of our beloved Ruler, whose sympathy and solicitude for the welfare of his subjects is so well known, that no effort and expenditure should be spared in the course of working for the improvement of the economic condition of the masses and thereby raising their standard of life. It is hardly necessary for me to allude to the gracious act of His Highness who commanded His Government to grant remission and suspensions of *khists* on an unprecedented scale in the previous year on account of the distress conditions then prevailing in the State. Those of you that have followed the career of our distinguished Dewan, I am sure, are certainly impressed by the innate sympathy he has for the masses in general and the rural folk in particular. His one motto in life has been to strive for the betterment of the common man. It is not a mere formal expression of his desire to improve the condition of the common man. We have plenty of evidence of his abiding interest in the well-being of the people. I have happily the help and co-operation of my colleagues who have not only been doing all that is necessary to improve the condition of the masses in their own spheres of work but also supporting me in the various activities connected with the departments in my charge. Government have, during the course of one year and a half, sanctioned a number of irrigation works. You are aware that the Lakkavalli Project costing nearly 12 crores of rupees has been sanctioned; Nugu Project in Mysore District costing Rs. 81 lakhs, Tunga Project costing Rs. 70 lakhs and some minor schemes—about a dozen in number—costing Rs. 2 lakhs to Rs. 15 lakhs, have been sanctioned and are in various stages of progress.

You are also aware that a scheme for an accelerated programme of restoration of minor tanks at an annual cost of 20 lakhs for a period of 10 years has been sanctioned and is in operation. Government have, in the course of one year and 3 months, passed some four orders granting various concessions for those intending to take power for irrigation pumps. This has encouraged more and more ryots to take power for irrigation pumps. While during the previous years the Electrical Department was servicing 10 to 15 pumps a year, during the course of this one year and three months more than 120 pumps have been installed and serviced. This is indeed encouraging. Applications for power have been pouring in and I do hope it will be possible for Government to meet the entire demand for power for irrigation purposes in a period of one year. While the Department had barely a dozen tractors, Government have recently placed orders to get in

all 60 tractors by the end of December 1947. You are, perhaps, aware that Government have recently accorded sanction to various post-war schemes relating to departments of Agriculture and Animal Husbandry, costing several lakhs of rupees, both recurring and non-recurring. I may take this opportunity of thanking Rajasevasakta A. K. Yegnanarayana Iyer, who, with his rich knowledge and varied experience of Indian Agriculture, has been rendering yeoman service to the State in his capacity as Chairman of the Policy Committee for Agriculture and also as Chairman of the Board of Agriculture.

I may mention here some of the important schemes sanctioned by Government:—

(1) A scheme for the multiplication and distribution of improved strains of paddy seeds and manure which is expected to make the State self-sufficient in rice.
(2) A scheme for the wide distribution of improved agricultural implements by subsidising the cost to the extent of 25% of the cost.
(3) Schemes for the starting of more experimental and demonstration farms in taluk headquarters in the State.
(4) A scheme for the manufacture of compost from agricultural wastes.
(5) A scheme for popularising tractor service in the State.
(6) Starting of more Kannada Agricultural Schools both in Maidan and Malnad areas in the State.

Some of these schemes are already in force in the State on a moderate scale. Work on some of these schemes has commenced in right earnest. Government are aware of the difficulty in getting the required quantity of manure and implements on a progressively wider scale. With a view to getting over this difficulty, the establishment of a fertilizer factory, at a cost of nearly 3 crores of rupees, is under the active consideration of the Government. In this connection, I have to acknowledge on behalf of Government the very valuable advice given by Sir J. C. Ghosh.

A proper implementation of all these schemes requires a band of young men, who are well trained not merely in the various courses that are taught in your school and college, but, who have led a disciplined life. It is with this background I want you, Mr. Principal, to realise your high responsibility in the shaping of the career of those that are entrusted to your care. I am certain that the various activities undertaken under the auspices of the Association, which I inaugurate to-day, will help to make the boys a band of disciplined young men.

I appeal to you, my young friends, to cultivate a sympathetic and benevolent attitude of mind towards the rural folk, who are comparatively less fortunate than you are. For, without that sympathy and true understanding of their problems, you will be of little use to them and to the country at large.

In conclusion, I must congratulate the members of the Association on their good fortune in having amidst them to-day Sir J. C. Ghosh, who has kindly consented to deliver the Inaugural Address. Sir J. C. Ghosh has travelled far and wide and his sympathy for the poor and oppressed is well known. To-day, you could not have chosen a more appropriate savant than Sir J. C. Ghosh to advise you on the eve of your forming this Association.

Now, I request Sir J. C. Ghosh to deliver his Address.

Inaugural Address delivered at the Agricultural Students' Association, by Sir Jnan Chandra Ghosh, Kt., D.Sc., F.R.A.S.B., Director, Indian Institute of Science, Bangalore, on 15th February 1947.

Hon'ble Mr. Siddappa, Mr. President and Friends,

I thank you for your kind invitation to deliver the Inaugural Address to your Association this evening. I am particularly glad to have the opportunity of learning first-hand from the Hon'ble the Minister for Agriculture, the immediate plans for the development of the agricultural resources of the State. It is unfortunate that a predominantly agricultural country like India should have to import from abroad food grains at a prohibitive cost to save millions of our people from starvation. In the financial year 1946–47, India had to spend about 100 crores of rupees for purchase of food grains from surplus countries; and if this state of affairs continues, all our hopes for obtaining capital goods and machinery from America and Western Europe with the aid of our favourable trade balances and sterling assets, will vanish in thin air. There is no problem which demands more urgent solution in every part of India than that of self-sufficiency as regards foodstuffs. I do hope that under the leadership of a popular Minister, the State of Mysore would soon reach this goal.

I note with pleasure the enthusiasm of the young men who have joined this infant institution. I am told that they represent a few dozens of picked men from hundreds of applicants for admission into the Agricultural College. They have taken this degree course in agriculture in the hope that men trained in such courses will have the knowledge, strength and facilities to develop the resources of the country. Indeed, the conviction that courses in applied science will contribute to the prosperity of the country is widely prevalent in India to-day. Applied sciences were not so popular in the days when I was a young student like you. The bright boys often used to take up for study subjects like humanities, law, mathematics, and then as second choice, subjects like

economics, pure science, and if every thing else failed, engineering, agriculture, etc. I am glad to note this change in the mentality of our young men.

For centuries, education meant only the acquisition of the mental outlook of the scholar. It did not include the capacity to make a living. Technical science has languished in India because of clever men's contempt for manual work. In the western countries however, dignity of work became an article of faith in the nineteenth century when upper classes had to engage in manual work as a necessary basis of technical and scientific knowledge. In the twentieth century, in those fortunate lands where education became universal, and educational expenses were considered as first charges on the resources of the State, skill in work became an integral part of educational aims and purposes. Training took a high place by the side of learning, and the practical and social purposes of education were considered as important as the ideal and the individual. I am glad that this world movement has gripped the youth of Mysore. The student of to-day should be the worker, even more than the citizen of to-morrow; and in a well-planned economic system, his place in farm, office or factory, should, in the vast majority of cases, be ready there for him earmarked well in advance of the completion of his studies. I wish our political leaders, who often quarrel about loaves and fishes of office, understood this fundamental implication of planned development. If such planned development were pushed through with the greatest determination, if everybody put his shoulder to the wheel, we shall find, that in the initial stages of our progress, there will be more jobs than competent men to take up such jobs. The question of reserving a job for a non-Brahmin or a Brahmin will not arise—the cry will be how to get the men for the jobs. May this great expectation be realised in Mysore in the immediate future !

Indeed your Sir M. Visvesvaraya has been responsible for starting the slogan—Plan or Perish. This thought is uppermost in the mind of those who are anxious to develop our motherland on the basis of four freedoms.

In the special circumstances of our country, the common man everywhere in this land should be secured this freedom; and all our plans of post-war reconstruction is based on the confidence that it is possible to do so. In creating this confidence, applied sciences have played the dominant role.

Let us see what these wants and aspirations of the common man are. Every man would like to have a good training for a profession while young and when grown-up would like to be provided with some employment suited to his mental and physical make-up. He would like to have a decent home, adequate food, clothing and other necessaries of life, and reasonable protection from disease for himself and members of his family through life,

and a certain surplus which will enable him to have some leisure and opportunities for cultural development. Such a state of society has been the dream of founders of religion, saints and philosophers. But the Kingdom of Heaven portrayed above has not been realised in human history. The real cause was that with the tools and methods of production at his disposal, man, till recently, found it physically impossible to produce commodities and develop services essential for the full life of every member of the society. The strong only could reach the aforesaid standard of living by depriving the weak of the fruits of their labour in one way or other.

Technical Science came into this picture about 150 years ago, and caused a silent and extremely potent revolution in the methods of production, distribution and transport of goods and commodities. Human muscles need no longer bear the pain that machine can bear. Every man—and not the strong only—can have hundreds of slaves in the form of machines. In Western Europe and the United States of America, where practical advantage was taken of this new knowledge, conditions of living changed beyond recognition. In spite of temporary set-backs which are caused by large-scale wars, it is evident that Science has placed in our hands such methods of production and distribution, that there is no reason why the people of every country should not enjoy a fuller and more satisfying life, provided the country possesses sufficient natural resources and the people have the genius to explore and exploit them. The few millions of Red Indians, who lived in North America three centuries ago, had no idea that their problems of food and living could be satisfactorily solved by any other method except by continuous wars of extermination between the tribes for the possession of small fields of maize and corn. Yet to-day, thanks to technological advance, the same country maintains 130 million human beings with food in such excess that to keep prices up, maize had to be burnt ten years ago and milk run down the rivers. The standard of living was so high before this war, that there was a motor-car for every five persons. Sanitary and prophylactic measures have been so improved that the average expectation of life is about 65 years, which is more than double that of a Mysorean. All this has been due to the ability of the people in harnessing the power that modern science has placed at their disposal. Continuous efforts are being made there to learn the secrets of healthy living, to gain mastery over the forces of nature, to make new materials having desirable qualities, to increase the productivity of the soil, and to improve the quality of crops and live-stock by selective breeding and scientific management.

It may be argued that such spectacular progress has been possible because of the continuous efforts of an intelligent people spread over a period of 150 years. Russia has shown successfully

that such long years of slow progress may be jumped and a forced march in economic development is possible by deliberate national planning. In 1917, when the Bolsheviks seized power, Russia was only on the threshold of industrial development and no better than India at that time. The Bolshevik leaders recognised that political revolution was no end in itself. It must be followed by a technological revolution which must at least bring up every Russian citizen to the level of his fellows in Western Europe as regards standard of living, efficiency of production and facilities for self-improvement.

The Russians also recognised that in the ultimate analysis, wealth is the result of work done by man, with his hands and his bullocks, with the aid of machines and productive assets. It cannot be had as a result of wishful thinking. Nor does it descend to us from Heaven as a result of prayer. Take the case of agriculture—here the wealth produced is the crop harvested. A man with a pair of bullocks can cultivate 5 acres of rain-fed lands in Mysore and produce, say 20 pallas of paddy. If he has been trained properly as a technician, he can with the aid of a tractor and harvestor cultivate 100 acres of rain-fed lands and produce 400 pallas of paddy. Where, however, the State has invested a part of its national income in building-up a water reservoir and irrigation canals, the yield per acre of paddy may increase from 4 pallas to 20 pallas. So one man with his modern agricultural machines working on irrigated lands can produce 2,000 pallas of paddy as against 20 pallas of paddy by primitive methods in undeveloped land. The wealth that he creates is thus increased 100 times. Take again a typical case in industry—a cottage weaver with his handloom which costs him Rs. 25 has an output of Rs. 45 per year in terms of rupees; with a power-loom installed in his cottage which costs Rs. 350, he has an output of Rs. 250; in a modern textile mill in Mysore where the capital investment per worker is Rs. 1,200, his output is Rs. 650, *i.e.*, 15 times the output by primitive methods. In Japan, the output per worker in an efficient mill is Rs. 2,200 which is 50 times that of a cottage worker in India. For labour of average skill and efficiency, the ratio of capital invested to output per worker in modern industries may be taken as 2. The problem before us in India is to find employment for 100 million adults which is about one-fourth of our total population in modern productive enterprises, which may require a capital investment of two hundred thousand million rupees.

But look at the actual picture. More than 70 per cent. of our people live and work as mediæval peasants on subsistence level,—prey to ignorance, disease and malnutrition,—and do not produce enough food for the entire population even at a low level of nutrition. In U.S.A., 25 per cent. of the people are dependent on agriculture and produce enough food to maintain

the entire people at a very high standard of nutrition and also some excess for export to unfortunate people like us who are always on the verge of starvation. Sometimes when this excess cannot be exported for lack of transport or other reason, it has even to be destroyed. Even a week ago, news were received that 2 million tons of potatoes in U.S.A. were being ploughed down for lack of consumers. The remaining 75 per cent. of the people produce in U.S.A. what are called amenities of modern civilized life. It is for our agricultural planners to remedy this alarming situation, to take effective measures which will ensure an optimum man-land ratio and implement a rational population policy. I may revert to this point later. I was told by a responsible officer of the Foreign Economic Administration in Washington in 1944 that if our 400 million people were to take a year's holiday, their present requirements of food, clothing and other services could be met by 6 million American workers transported to India but provided with modern machinery,—with modern tools of production. Here is the obvious weak spot in our economy—lack of machinery, lack of modern tools, and lack of skill in handling such tools. How to provide these things that we lack so much? Such things can be had only by investing savings from our national income in capital goods and by no other means. In the early years of her planned economy, Russia was investing 30 per cent. of her national income in productive enterprises, with the result that she invested 10,000 crores of rupees in 10 years from 1928–38, in industry, agriculture and transport, and thus raised the income per head 3½ times, *i.e.*, from Rs. 82 to Rs. 250 per year. How did she make such savings? By a nation-wide campaign of voluntary saving, but more effectively by imposing a turn-over tax, by imposing a well-planned system of rationing. In our country too, when national effort is mostly directed to resource development, consumers' goods will be in short supply. The system of rationing which has now been organised in all the cities of India is on the whole a good thing in disguise. As a logical development, it should, if continued as a policy and handled by an honest and efficient Civil Service—I lay special emphasis on the qualifications of honesty and efficiency—it should eliminate unnecessary middlemen and effectively curb all exploiting tendencies on the part of agencies purchasing raw produce and selling manufactured goods. Rationing under planned economy should aim at giving each citizen certain minimum requirements of life at controlled or even subsidised prices. In England they subsidise bread by a grant of 90 million pounds, and now sell utility goods in limited quantities almost at cost price. In the last phase of the war every man and woman above the age of 14 was conscripted for national service. This full employment of her people raised the income of England from six thousand million pounds in 1939 to nine thousand million

pounds in 1945; but of this nine thousand million pounds, about 4·5 thousand million pounds were spent in aid of efforts to win a total war and the remaining 4·5 thousand million pounds was utilised to produce and import consumers' goods which were distributed according to coupons. In India too, in future, utility goods in excess of rationed quantity and all non-essential commodities should be sold subject to a turn-over tax to be fixed by the Planning Commission. Such a turn-over tax forms the backbone of Soviet Finance and was responsible for giving the State a revenue of 106 billion Roubles in 1940 out of a total revenue of 178 billion Roubles. Soviet communism, in its newest phase, permits payment of wages according to ability but limits severely the purchasing power of high incomes. A rapidly accelerating industrial development in the early stages cannot be achieved without some tears; we have an advantage here—our people are accustomed to shedding tears—I hope they will be less copious as the years roll on. It cannot certainly be achieved without a tightening of the belt for those whose waistline shows signs of expansion —who have grown fat on the riches of the land. A well-thought out turn-over tax coupled with a campaign for saving would place enough resources in the hands of the planning authority to transform in 15 years a helpless ignorant starving people resigned to the vagaries of fate into a self-reliant, well fed, literate mass of men united together by a vigorous willing effort into a co-operative team.

With the Hon'ble Member for Agriculture as the principal guest of the evening, I cannot resist the temptation of saying a few words about agricultural planning. These observations may be commonplace, but there is virtue in repetition which is the essence of all propaganda. For good cause one should not hesitate to do some propaganda—even a scientist like myself. If funds are available on an adequate scale, our agricultural planners should pitch their ambition high and develop their activities on the principle, that he who aims at the sky shoots much higher than he who aims at a tree. Here the obvious target is the maximum production of foodstuff, cereals, vegetables, oils, fruits, milk and meat per acre with the minimum man power. For this, not a drop of water that is received by the soil of Mysore should be allowed to go to the sea except as the Chief Engineer of Irrigation, who is sitting next to me, wish it. The renovation of the 2,100 minor tanks, the execution of 30 minor irrigation projects and substantial progress on the bigger projects like Lakkavalli, Hulhalli, Gorur and Nugu, should be possible in ten years, and the completion of the latter irrigation projects in another 5 years. In 15 years it should be possible to so arrange, that the soil of Mysore does not get a seed which is not the best of its kind, and that every bit of organic matter, which is produced by capturing he energy of the sun and the moisture and minerals of the earth, t

is put back to soil as compost, and that the soil gets in addition, from the factories of Mysore, synthetic fertilisers in such quantities as are considered essential for the maintenance of fertility at the highest level. This is not difficult of achievement. Technicians can do that if they are given adequate financial resources. But the most serious hurdle is to ensure the condition that the production of vegetable and animal food *per man* engaged in such jobs should reach a maximum at an early date. Here we come across psychological problems which can be solved only by leaders of public opinion like the Hon'ble the Minister for Agriculture. We are immediately dependent on two factors which are related to progress in other fronts of planning activity. Firstly, the rate at which human labour becomes surplus in agriculture depends on the rate at which capital can be invested in agriculture, in securing modern mechanical labour-saving implements and in laying out fields so as to make possible effective use of such implements. Secondly, the rate at which labour can be displaced from agriculture should obviously be the rate at which such surplus labour can be given gainful occupation in industries, transport or social and professional services. It does not do any one good to create an increasing army of unemployed in rural areas. Progress, however, in this direction will very largely depend on the success with which we can implement a rational policy in the growth of population in the rural areas. Unrestricted increase in population, tied down to soil by immemorial tradition, always tends to bring down the standard of living to subsistence level. On the advent of the Irwin Canal, the population of Mandya in a decade increased by 27 per cent. and with effective antimalarial operation it will, if not artificially checked, increase by another 30 per cent. in 1952. The result will be an inevitable decline in the standard of living, if agriculture remains the sole occupation; and it will not be surprising if the 1,000 iron safes now to be found in the homes of peasants find their way soon into the moneylenders'. Control of the growth of rural population is the crux of agricultural planning. The increase in agricultural production must be very much faster than the increase in population which are dependent on agriculture. Wise planning of the family for a people, who are heirs to an ancient civilization, is a problem which bristles with difficulties, which demands almost a complete change in social outlook. For success in this endeavour the planning authority must be able to draw upon the fanatical enthusiasm of the conscious minority, like the young men who are gathered here, who believe in planning for human betterment.

These are the highways of progress in agricultural development; and like all highways they require for their building up, expenditure of funds and human efforts on a massive scale. There is, however, another way which depends more on the ingenuity

of a few master minds rather than on a frontal attack planned in terms of existing knowledge. For example, spectacular progress is possible if we can introduce in our fields new plants for old—new plants having far better properties and giving heavier yields.

The science of genetics is barely 50 years old; it has already worked wonders; and now that we are beginning to know how to induce mutations artificially it will achieve greater wonders still. In 1944, I was told in England, that by selective breeding, the size and sugar content of beet roots had been increased three times, and the home production of beet sugar had been equivalent to the domestic sugar ration of the whole country during the war. Last summer I was told in Egypt that the cotton-growing industry there would have met with disaster but for a variety known as U_4 selected and developed by Fahmy which is resistant to the jassid insect. In 1945, I was told in U.S.A. that McFadden had even made a cross of two species of wheat having different chromosome numbers and produced the fertile wheat known as the Hope which had been of the utmost value in supplying rust-free varieties for use in North America and Canada. The Russians who sent a strong delegation to the Indian Science Congress last month have completely changed the science of potato breeding by introducing new blood into the potato by crossing the cultivated European potatoes with the wild varieties that grow in the mountains of Mexico and the Andes. Thus they have produced potatoes which can resist frost and grow in Siberia, others which are resistant to potato blight, and still others which can mature when the days are short and which may therefore offer immense possibilities in tropical countries of short days such as India. Fertile crosses between different genus are still more difficult, but new technique have been evolved for achieving them. Muller was awarded the Nobel Prize last year for his pioneering work in this field of artificial mutations. The best known and the most spectacular work was the production of a hybrid between a radish and cabbage in Russia in 1927 which has been developed into a fertile cabbage of great size and utility. We are on the threshold of a new era in plant breeding. Men of genius with limited resources can do far more for the progress of agriculture than the average man can do with far greater resources. I hope this College will make special effort to discover talent for original research and give such talent the fullest scope for developing the science of plant breeding and other promising fields of enquiry with special reference to Indian agriculture.

The task of transforming the economic and social life of rural folk in the shortest possible time is an exceedingly arduous task. It cannot be achieved by peremptory commands and prohibitions. It involves changing the contents of the minds of the whole people. It demands universal education and persistent

propaganda, patient argument and personal example. It is to this task that our young men who have had the blessing of a scientific education may be called. Every thing will depend upon them, on their unbendable rectitude, single-minded devotion to duty and their capacity for intelligent work. That there should be wide-spread poverty and misery in a country so lavishly endowed by Providence with man-power, talent, and natural resources is an intolerable paradox, a disgrace which should fill us with shame and with a burning desire to wipe out this terrible mess which our people have come to. The obstacles, doubts, set-backs—there are many; but they should arouse you to greater endeavour. May you rise to the height of the occasion !

Field Control of the Earhead Pests of Jola (*Andropogon Sorghum*)

By M. Putta Rudriah, B.Sc. (Hons.)
Senior Assistant Entomologist

Introduction

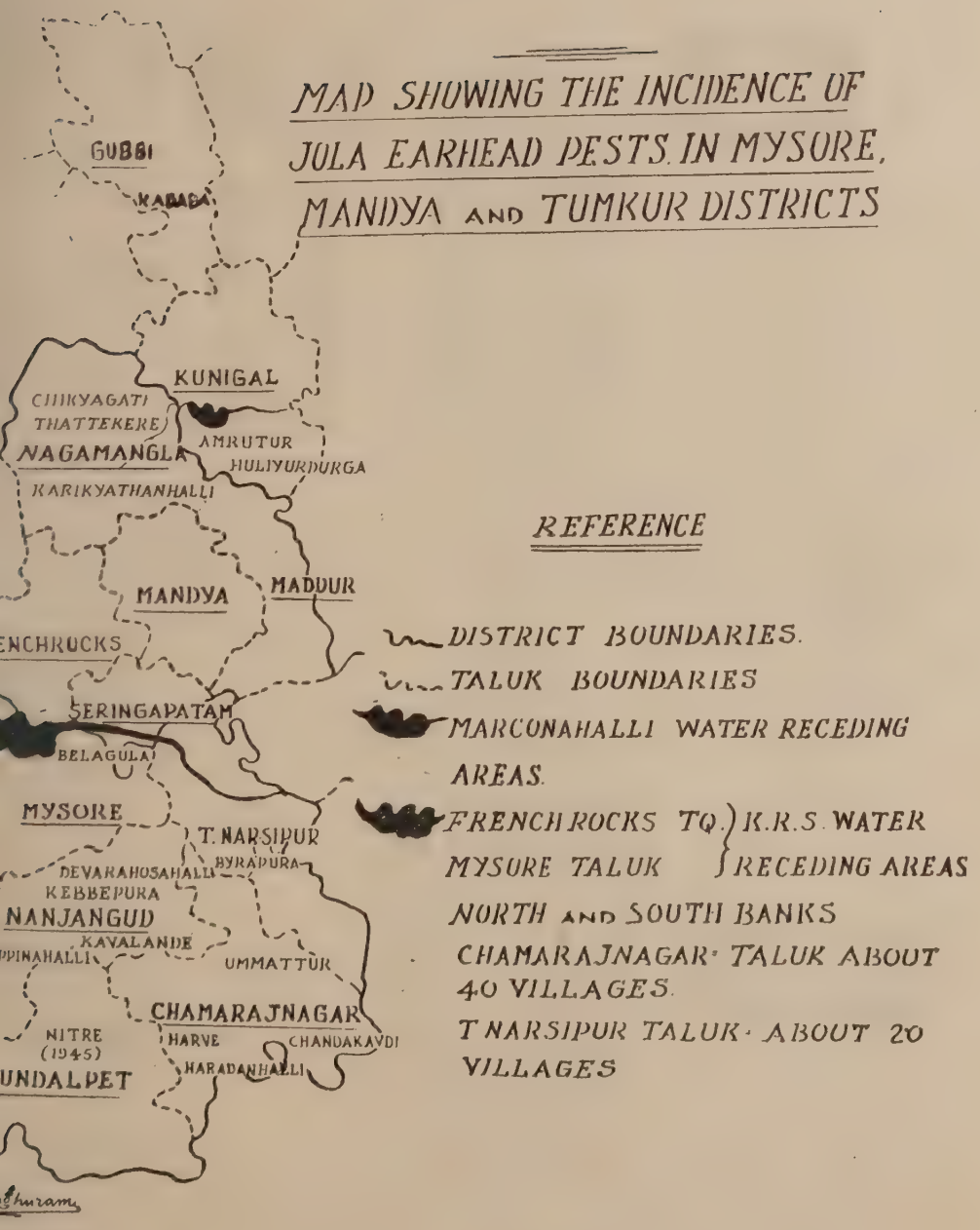
Jola is one of the important food crops of the State and is grown to the extent of about 2,00,000 acres in Mysore District, as Mungar (pre-monsoon) crop. Two varieties—the open and the compact type—are grown. Though both the varieties are subjected to the attack of the pests, the compact type affords better facilities for the earhead pests to multiply and cause damage. It has a number of insect pests causing appreciable damage to the crop, of which the earhead pests are dealt with in this article.

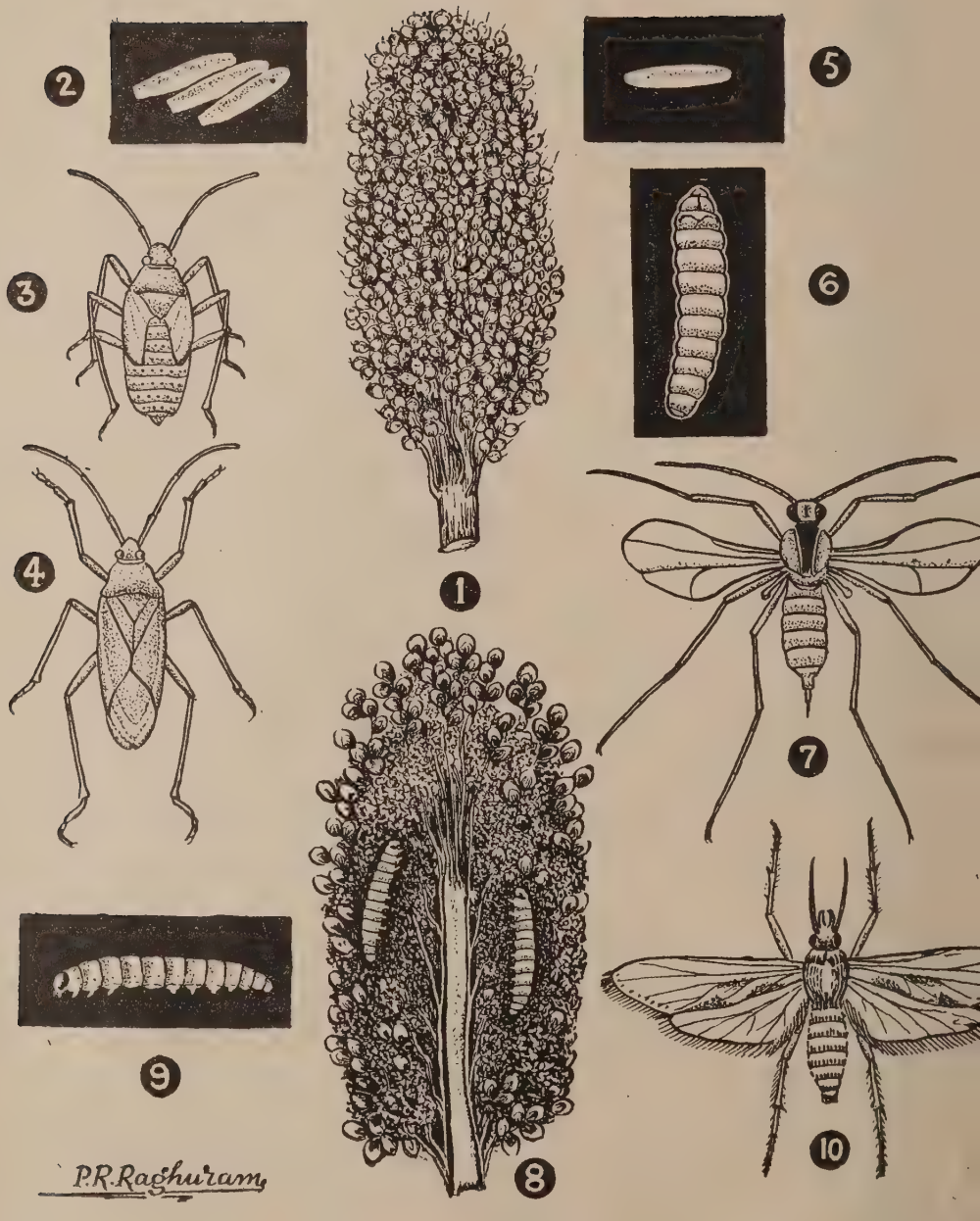
Incidence

During April–July 1944, the incidence of the earhead pests was very serious. An extensive survey of the affected taluks of Nanjangud, Chamarajanagar, T. Narasipur and Gundlupet was made, and it was found that the ryots had suffered a serious loss, to the extent of about 75% particularly in the late sown areas, by the depredations of the capsid bug—*Calocoris angustatus* L., commonly infesting the tender grains as they form in the earhead and popularly called " ಅರುಶಾಲು ಚಟ್ಟೆ ", the earhead fly—*Contarinia andropogonis* F., whose maggot also sucks up the sap from tender grains and the webbing caterpillar—*Stenochroia elongella* H., living under cover of a web and cutting the grains of better developed earheads.

In 1945, these pests were noticed again localised only in small areas of Chamarajanagar, T. Narasipur and Nanjangud taluks. The incidence was also low, the damage caused being negligible, as the insects appeared at a time when the grains were about to harden and the surrounding areas were ready for harvest.

In 1946 jola was grown extensively in Krishnarajasagar water receding areas of Mysore and Mandya districts and in tank Achkats of Kadaba, Kunigal and Marconahalli projects of Tumkur District; the sowings were at different intervals of time as the water receded, so that there were all stages of crop close to each other. The insects assumed the status of a pest in all these areas during June '46, infesting tender earheads of the late sown crop. It was expected that the incidence of these pests would be virulent in the different taluks of Mysore District, as the jola fields of these taluks are contiguous commencing from


MAP SHOWING THE INCIDENCE OF
JOLA EARHEAD PESTS IN MYSORE,
MANDYA AND TUMKUR DISTRICTS
GUBBI
KABADA
KUNIGAL
CHIKYAGATI
THATTEKERE
AMRUTUR
NAGAMANGLA
HULIYURDURGA
KARIKYATHANHALLI
MANDYA
MADDUR
ENCHROCKS
SERINGAPATAM
BELAGULA
MYSORE
T. NARSIPUR
HYRAPURA
DEVARAHOSAHALLI
KEBBEPURA
NANJANGUD
KAVALANDE
UMMATTUR
CHAMARAJNAGAR
NITRE
(1945)
HARVE
CHANDAKAVDI
HARADANHALLI
UNDALPET
REFERENCE
DISTRICT BOUNDARIES.
TALUK BOUNDARIES
MARCONAHALLI WATER RECEDING
AREAS.
FRENCH ROCKS TQ. } K.R.S. WATER
MYSORE TALUK } RECEDING AREAS
NORTH AND SOUTH BANKS
CHAMARAJNAGAR TALUK ABOUT
40 VILLAGES.
T NARSIPUR TALUK - ABOUT 20
VILLAGES



Jola Earhead Pests

1. Infested Jola earhead
2. Eggs of earhead bug
3. Nymph
4. Adult bug
5. Earhead fly
6. Maggot
7. Adult fly
8. Jola earhead damaged by webbing caterpillar
9. Webbing caterpillar
10. Moth of webbing caterpillar

the Krishnarajasagar water receding areas. But, actually, the incidence of the earhead bug and the fly was mild in T. Narasipur and Nanjangud taluks and somewhat severe in parts of Chamarajanagar, and totally absent in Gundlupet Taluk. The presence of the webbing caterpillar also was not much felt.

Brief Description of the Earhead Pests

The earhead bug (*Calocoris angustatus* L.).—The adult is a small yellowish green bug with long limbs and feelers. The colour of the young nymphs varies from scarlet red to green with brownish tinges. Whitish cigar-shaped eggs are thrust in between the glumes and the tender grains, by the female bug; on hatching, the active nymphs and the adults suck up the juicy contents of the tender forming grains. In cases of severe infestation, hundreds of these bugs can be seen on the earheads, resting like mosquitoes; the adults fly about the moment they are disturbed. As a result of damage the earheads become chaffy and are left without normally developed grains.

The earhead fly (*Contarinia andropogonis* F.).—This is a small reddish fly with long legs and beaded feelers having whorls of hairs at each joint. Eggs are slender, transparent, reddish in the middle and banana shaped. They are thrust by the mother fly singly or in clumps, in any part of the flower—between the glumes or in the grove of the anthers. The maggots breed in the tender grains and the seeds become empty. In practically all cases of bug attack, the presence of the flies can be made out. In bad cases, hundreds of these flies can be seen resting and hovering about the earheads.

The earhead caterpillars.—Three caterpillars have been noted damaging the well-developed grains in the earheads, one being *Eublemma silicula* S., caterpillar of a small brown Noctuid moth, the other *Celama internella*, an arctiad caterpillar being minor, and the third, more common and serious is the pyralid caterpillar, *Stenochroia elongella* H., which lives under the web of grains and cuts them into bits. The moth is dry straw coloured with long narrow wings. The infested earheads become black from the excrement entangled in the webbing and broken grains.

Control Campaign

In order to take all possible measures of prevention and control of the pests in all the areas at the time of the formation of earheads, Government sanctioned a scheme in their Order No. A.F. 4711–12/Agri. 111–44–2, dated 14–4–1945 and A.F. 5368–73/Agri. 183–45–2, dated 12–4–1946 for appointment of temporary staff, etc., to conduct large-scale demonstrations of a control measure in all the taluks for a period of 3 months from June to August during 1945 and 1946.

The jola areas of Mysore, Nanjangud, Gundlupet, Chamarajanagar and T. Narasipur taluks were divided into 8 centres, each centre being in charge of a trained fieldman and 3–4 coolies mainly for propaganda work among the ryots in all the villages of each centre and for carrying out demonstrations. Large quantities of cheap and non-poisonous insecticides were stocked in the various Agricultural Depots for distribution among the ryots.

Insecticide Employed

As a result of series of experiments with several cheap and easily available substances initiated by the Entomologist, Mr. B. Krishnamurthi, the final choice fell on a mixture of equal parts of very finely powdered soap and tobacco waste; this mixture was used for large-scale dusting of jola earheads of all stages of growth with excellent results. Soap and tobacco, apart from being efficient contact insecticides, possess the further qualification of being easily procurable in rural parts and being entirely harmless to the ryots. The mixture acts as a powerful contact poison. While the infested earheads are dusted some of the adult bugs and flies fly away and some nymphs drop down. The other bugs, when they come in contact with the powder in the earhead, also drop down to the ground in a short time; they become paralysed, and die later. If the earheads are properly dusted, they become free from the bugs and flies in 24–48 hours. Uninfested earheads when dusted by this mixture, keep away the bugs and flies for about a week, if not longer. They were found to drop down and die, when they tried to settle on such dusted earheads.

A Simple and Cheap Duster

A bamboo-basket contrivance easily made in any village by the bamboo mat-weavers or by the ryots themselves for applying the insecticide mixture, was also devised as per the design suggested by the Entomologist. The diameter of the cylindrical basket is just wide enough to cover a fairly big earhead, its height being about 9 inches. It is fixed in the middle of a fork at one end of a convenient pole of about 4 to 6 feet in length. A thin muslin cloth is tied loosely to the interior of the top of the basket, so that the cloth hangs inside, in the form of a funnel. The insecticide is put in the cloth and the cylinder closed with a bamboo lid, so that the powder does not spill out, while the basket is moved right and left in the act of covering the earheads with the powder. When the powder is exhausted, the lid can be opened and a further quantity put in. A man can stand at one spot and can dust earheads on either side of himself as far as the pole extends. Rows of plants can be regularly taken and all the earheads effectively dusted. The cost of the contrivance is 3–4 annas and can be easily made at a moment's notice. It was

found to work very well as the entire earhead can be covered with the dust on all sides, while the contrivance is moved just over the earhead and given a jerk for the dust to spread out through the cloth.

Loss of powder is prevented entirely. This simple home-made duster can be used in place of the mechanical bellow-dusters which are not only very costly but are quite unsuitable for treating earheads at various heights, as their use not only fails to cover all parts of the earhead, but also involves a very appreciable amount of wastage of the dust.

Area Dusted

A total area of 130 and 680 acres of jola was dusted during 1945 and 1946 respectively; the mixture was also distributed to the ryots of Kadaba, Kunigal, Marconahalli, Nagamangala, and K. R. S. Water receding areas, for dusting the earheads.

Conclusion

Experience during the last three years has shown that the late sown jola which comes up for harvest during August, is especially subjected to the severe attack of the earhead pests. The havoc caused in 1944 was largely due to the presence of a large acreage of late sown jola in the four taluks of Mysore District. The peak in the incidence of the bug and the fly and their damage coincides with the developing grains during July–August. During 1945, most of the jola was sown early enough, *i.e.*, beginning of April and the harvest was almost finished by the middle of August. The grains with earheads had sufficiently hardened and little or no damage was therefore caused by the bug or the fly. So, it is advisable for all the ryots to complete the sowings of jola by the beginning of April, in ' Revathi ' rains alone, so that harvest can be done by beginning of August. This, of course, depends on receipt of timely and sufficient rains.

I am grateful to Mr. B. Krishnamurthi, Entomologist, for his kind suggestion and help in preparing this article. I am also grateful to Mr. P. R. Raghuram, Artist, for the diagrams.

The Green Beetle Pest (*Leptispa pygmoea*) of Paddy and Its Control in Malnad in 1946

By Syed Usman, B.Sc.
Junior Assistant Entomologist

The Green Beetle pest is confined to the Malnad districts of Kadur, Shimoga and Hassan. The ryots have known the damage caused by it for many years, although very few of them had actually seen the insect responsible for it. Locally, the damage is called "*Katte*"; in fact any disease or pest, which causes an infection of the leaf turning its colour from green to brown or whitish is locally known as "*Katte*". This year owing to heavy and continuous rains from June to September, this insect multiplied into large numbers and became a very serious pest. It was first reported in July from Sringeri and Koppa taluks in Kadur District, and soon after similar reports were received from Hosanagar and Thirthahalli taluks in Shimoga District. Investigation of the pest and control measures was taken up immediately.

Briefly the life-history of this insect is: the eggs are laid on paddy leaves and the grubs, which hatch out, feed on the upper surface of the leaves, the attacked leaves usually folding over so as to hide the grubs; the grubs, when full-fed, pupate on the leaf, the beetles emerging out after a few days. Two or more grubs may be present on a single leaf eating out longitudinal patches. The parent beetles also feed on the leaves, but to a less extent. Two to thirteen beetles have been noticed on a single leaf-blade. The population figures are as follows:—

(*a*) Severely infested fields: All the clumps are infested and 4–5 beetles are found on each tiller—counts taken at random per sq. ft. in 6 places in each field, gave an average of 31 beetles.

(*b*) Moderately infested fields: An average of 11 beetles per sq. ft. was recorded.

(*c*) Freshly infested fields: An average of 4 beetles per sq. ft. was recorded.

Methods of Control.—The commonly recorded remedy is collection of the beetles in bag-nets or hand-nets. The following treatments were tested:—

(1) Use of Insecticidal Plants, *e.g.*, *Tephrosia nicotianifolia*, Tobacco decoction and dust, bamboo (tender), etc.
(2) D.D.T. Spray and dusting.
(3) Sodium silicofluoride dusting.
(4) Light traps.
(5) Kerosene treatment.
(6) Dusting with Gammexane.

Leptispa pygmæa

1. Infested seedling
2. Eggs
3. Grub
4. Pupa
5. Adult beetle

(1) to (4) gave negative results, whereas (5) and (6) proved successful. Both laboratory and field trials were carried out in each case.

Kerosene Treatment

Treatment of the affected transplanted areas with kerosene oil was carried out. The oil was first allowed to spread evenly on the surface of water in the plots by keeping a piece of cloth well soaked in the oil at the water inlets. Sticks were then drawn across the top half of the crop back and forth so as to dislodge the adult beetles. A country broom made of leaves and soft twigs was also used for this purpose. An even kerosene oil film on the surface of water and dislodging the maximum number of beetles by repeated manipulation were the important factors for obtaining satisfactory results. 75% to 80% beetles could be dislodged and 99% of the dislodged beetles were killed. The minimum quantity of kerosene oil required was six bottles costing Rs. 1–4–0 per acre. This treatment was found to be the cheapest, highly effective and the most practicable remedy.

However, the kerosene treatment cannot be given at the nursery stage, since kerosene oil has a charring effect on the tender seedlings. The remedy at this stage is top-clipping of the seedlings at half foot level and collecting and destroying all the clipped top portions with the beetles.

Dusting with Gammexane

Gammexane D. 919 dust was diluted with wood ash to get a 5% concentration. The affected transplanted area was dusted with this powder, care being taken to leave a residual film on the leaf surfaces visited by the beetles. The action of the dust was slow and it took beetles 3 to 4 hours to die according to the amount of the dust contacted. Once a beetle came into contact with the dust, it was definitely killed. But a 40% to 45% mortality was all that could be obtained by large-scale dusting of the infested fields. Approximately 4 lbs. of Gammexane, costing Rs. 2, was required per acre.

The advantage of dusting with Gammexane is that the treatment is applicable to rainfed paddy fields—"*Makki lands*"—where kerosene treatment is not possible and also in cases in which earheads have appeared, at which stage disturbing the plants is not advisable.

Treatment with High Acidity Transformer Oil

This acid oil was received in the latter part of October from the Mysore Electric Department on a request made by the Director of Agriculture. It was tested against the pest in the same manner as the kerosene treatment. For all practical purposes the results obtained were similar to those with kerosene oil,

Field trials under rainy conditions showed that the acid oil treatment could be given in rainy season also. It seems to be a good substitute for kerosene oil.

The total affected area of paddy in the three districts in 1946 is marked out in the following statement:—

Sl. No.	District	Taluk	Total cultivated area Acres	Total infested area Acres
1	Kadur	Chikmagalur	22,535	750
		Mudigere	21,131	1,000
		Koppa and Sringeri	18,074	2,300
		Narasimharajapura	11,515	600
		Tarikere	8,920	50
		Total ..	82,175	4,700
2	Shimoga	Hosanagara	25,118	400
		Thirthahalli	31,126	1,225
		Sagara	30,903	200
		Kumsi	12,335	500
		Total ..	99,482	2,325
3	Hassan	Manjarabad	32,820	953
		Alur	14 478	34
		Belur	20,977	600
		Total ..	68,275	1,587
		Grand Total ..	2,49,932	8,612

Besides the existing scientific staff of the Entomological Section and the District Agricultural Staff, a temporary batch of 20 maistries was appointed to help in the work of propaganda and demonstrations of the control methods throughout the affected area. Handbills dealing with the appearance of the pest, its habits and control, were distributed, and short notices on the subject were published in several popular English and Kannada newspapers.

Demonstrations of the control methods were held as follows:

Sl. No.	District	No. of demonstrations	No. of villages
1	Kadur ..	330	317
2	Shimoga ..	297	275
3	Hassan ..	162	97
	Total ..	789	689

In co-operation with the Civil Supplies and Revenue authorities arrangements were made for the supply of large quantities

of kerosene oil, and treatment of the fields by the ryots on a mass scale was organised in the different localities. The following table shows the details:—

Sl. No.	District	Kerosene oil issued Tins	Bottles	Kerosene oil used Tins	Bottles	Total area treated Acres	Guntas
1	Kadur ..	1,336	18	1,331	12	4,589	0
2	Shimoga ..	1,060	6	1,060	6	2,235	10
3	Hassan ..	253	13	220	5	1,540	5
	Total ..	2,650	13	2,611	23	8,364	15

In the latter part of September there was a break in the rains, and in many places the ear-heads made their appearance in the paddy fields. Therefore, Gammexane dusting was taken up by the departmental staff, and the ryots were educated in this method of control in certain areas of Thirthahalli, Mandagadde, Chikmagalur, Mudigere and Saklespur. In all 60 lbs. of Gammexane was dusted in the various affected areas.

In a number of places where the crop was severely damaged by the pest, top-dressing with chemical manures (Ammonium Sulphate and Superphosphate) was given to revive the plants. In a few cases top-clipping of plants at about half feet level was also done for their regeneration. Appreciable results were noticed in each case. The following statement shows the details district-war:—

Sl. No.	Name of District	Name of Taluk	Total quantity of manure used for demonstration Tons	Mds.	Area of paddy top-dressed Acres	Guntas
1	Kadur	Chikmagalur	—	—	—	—
		Mudigere	—	60	15	0
		Koppa and Sringeri	—	57	11	30
		Narasimharajapura	—	24	8	0
2	Hassan	Manjarabad	—	45	15	0
		Alur	—	—	—	—
		Belur	—	12	2	0
3	Shimoga	Hosanagar	—	37	25	20
		Thirthahalli	1	42	261	0
		Sagara	—	19	103	0
		Kumsi	—	16	20	0
		Total ..	4	72	461	10

By these measures the pest was brought under complete control by the middle of October. Bright sunshine and intermittent heavy showers at this time were also helpful to check its further spread.

In the history of paddy cultivation in the Malnad this is practically the first time that this insect assumed the status of a serious pest and increased to an alarming proportion. It is hoped that in the light of experience gained this year, more prompt and timely action will be taken by the cultivators in the future. A good deal of damage can thus be prevented. It must also be borne in mind by the cultivators that it is by means of close co-operation and simultaneous action only that the pest can be satisfactorily controlled.

Before closing, a reference is necessary to the whole-hearted co-operation of the Civil Supplies and Revenue authorities in the course of this campaign and to the assistance offered by them in the work of propaganda, and supply and distribution of large quantities of kerosene oil to the various affected areas.

My thanks are due to the Entomologist for guidance and helpful criticism in the course of this work.

Manuring with Town Refuse Compost

By Dr. S. V. Govinda Rajan, B.Sc. (Hons.), Ph.D. (Lond.), D.I.C., A.R.I.C.
Bio-Chemist

The importance of applying enough organic manures to soils for maintaining the fertility of the land and for increasing crop yields is not sufficiently realised by our ryots. Application of mineral fertilizers though producing immediate results by way of increased crop yields, tend to deteriorate the soil condition on continued use. On the other hand, organic manures, though slow acting, benefit the soil by building up in a cumulative manner its fertility. " Humus ", as the organic matter in soils is called, is the factor which plays an essential part in maintaining soil fertility, and an important part in helping the nutrition of plants.

Organic manures besides supplying plant foods, are the source of humus which supplies the food and energy materials needed for the development of soil micro-organisms. In addition, humus has the properties of improving the physical conditions of soil such as tilth, moisture retentivity, drainage, subsoil aeration, etc., which are essential for keeping the soil in a condition fit for the development of both the micro-organisms and the plant root systems.

Humus in soils is lost under normal cropping conditions. Its rapid destruction is facilitated by the high temperatures of our climate while high rainfall also helps to leach it out of soils. The destruction and loss of humus in cultivated soils is further hastened by the application of artificial fertilizers. To compensate for these losses, adequate applications of bulky organic manures, at least annually, are essential both to replace the lost humus and to maintain its level. At present the chief sources of manure for the ryot are the limited amounts of indifferently prepared cattle manure, supplemented occasionally by green manures. Other types like oil-cakes, bonemeal, and fish-meal are available only in limited quantities and their cost is also high.

Farmyard manure is not available in sufficient quantities to meet normal demands partly due to the use of cattle dung for fuel and the wasteful traditional methods of manure preparation. The available quantities of farm manure in the State are scarcely adequate to apply to the cultivated lands on the average at the rate of one ton per acre, while the satisfactory dose should be three to five times this quantity. Also the quality of the manure now being produced is poor on account of the neglect in collection of cattle urine which is rich in nitrogen and its conservation

along with the other farm wastes. Farm manure as prepared by ryots contains only about 0·5% nitrogen and 0·3% P_2O_5, which is indeed low. The insufficiency of the present sources of supply and the great need for supplementing these with other supplies to increase the quantity and quality of organic manures available is therefore easily seen.

The habitation refuses of towns and villages, such as street sweepings, market and slaughterhouse wastes, night-soil, sewage, etc., consist of a high proportion of organic matter and these are fit materials which can be turned into humus and serve as additional sources of manure. Though in a fresh condition these are not suitable for application to land, they can be converted by simple processing known as " Composting " into manure rich in both humus and the plant foods. This " Compost " resembles farm manure in appearance and in quality it is ever superior to it. In the course of composting considerable heat is produced and this destroys the dangerous disease organisms, fly maggots and weed seeds which the original waste materials harbour and finally yields a manure quite safe to handle, transport and fit for application to land. At the end of 4–5 months of decomposition the material appears as a dark spongy friable manure which can be easily spread and ploughed into the soil.

Town Refuse Compost possesses all the useful properties of farm manure described earlier. While containing a large percentage of humus (20–25%), this manure is generally superior to farm manure in containing more nitrogen (1·0 to 1·5%) and about 1% phosphoric acid. A ton of compost manure (about 2 cartloads or 50 cu. ft.) contains 20–25 lbs. of nitrogen, and 12–15 lbs. phosphoric acid, which alone should be worth well over Rs. 10. In addition to these, compost contains useful quantities of lime, potash and up to 500 lbs. of humus per ton.

At present a large number of municipalities in Mysore State have taken to converting their town wastes into compost and are thus making available a steady supply of manure for the benefit of ryots in the surrounding areas. While ordinary manure costs from Rs. 3 to Rs. 5 per ton at the present time and often more, many of the municipalities are charging for compost only about Rs. 1–8–0 a ton. Some municipalities offer well-sieved compost at a small additional cost. The manure is worth many times this price and hence it would be worthwhile to use this manure even if charges to load and transport the manure from the compost depots to the farmer's lands should be appreciable in proportion to the cost of the manure. It would be quite economical for the ryot even if he has to transport compost to his fields situated 5 to 10 miles away from the compost depot. Even if the ryot has to pay Rs. 5 to Rs. 6 per ton for the transport charges which, in most cases, he will not have to incur, it will still be profitable to

convey this manure, apply to the lands and recover greater return in the shape of increased crop yields.

The usual dosage of town compost for crops grown under irrigation or good monsoon rains like vegetables or irrigated food crops will be 15–20 cartloads (about 8 tons) per acre and for sugarcane 20–40 cartloads (15–20 tons), while for dry land crops grown under conditions of rainfall between 20–30″ the dosage may be reduced to 5–10 cartloads (3 to 5 tons) per acre. While the good effects of the easily available plant food like nitrogen will be seen on the growing crops themselves with the application of compost, the residual effect of the organic matter and other nutrients would show their effect on the succeeding crops also.

Compost is now being prepared by municipalities in most of the District and Taluk headquarter towns in the State. Other towns will soon start converting their refuse materials also into rich manure. Since the demand for manure is growing everywhere the compost prepared in most of these centres is having a ready demand. Increased demand for compost from ryots, which comes of the knowledge of its usefulness, will help to induce the Municipalities to prepare larger quantities of better manure and supply same at reasonably low costs.

Improved Methods of Preparation of Farmyard Manure and Farm Composts

By Dr. S. V. Govinda Rajan, B.Sc. (Hons.), Ph.D. (Lond.), D.I.C., A.R.I.C.
Bio-Chemist

The methods of preparation of farmyard manure as at present being followed over large parts of the State suffer from a number of defects. The usual methods of conserving the daily collections of cowdung, litter, and refuse are to heap them together in irregular heaps or else to throw them haphazard into large shallow pits. The chief defects of these practices are: (1) Rapid drying of the mass due to exposure to sun and air. This results in the decomposition of the material being slow and irregular. (2) Considerable loss of nitrogen by volatilisation on account of the exposed nature of the mass resulting in manure of poor quality. The nitrogen lost is chiefly from the urine admixed with the dung, and partly from the available nitrogen from the dung also. (3) The loss of the soluble manurial constituents from manure heaps by the unregulated fall of rainwater and leaching. (4) The quantity of manure finally obtained is low, owing to the greater loss of organic matter by decomposition in such exposed conditions. Moreover, in the present practices, little effort is made to conserve cattle urine and to utilise all the inedible refuse that could be collected on the farm, converted into compost and thereby a larger bulk of better quality manure recovered.

Preparation in Trenches

The method of preparing composts in trenches possesses many advantages which avoid the defects mentioned above. Further the trench method involves less labour while the moisture and plant food factors in the manure are conserved better.

Details of Trenches.—Depending upon the size of the farm, trenches of the following sizes need to be excavated.

No. of cattle in farm	Size of trench		
	Length	Breadth	Depth
2 to 4 animals ..	20 ft.	5 ft.	3½ ft.
6 to 10 ,, ..	25 ft.	6 ft.	3½ ft.
10 to 20 ,, ..	30 ft.	7 ft.	4½ ft.

The trenches should preferably have sides sloping inwards and the bottom also sloping to one end. Four such trenches will suffice for work all the year round. While the manure in two trenches mature, the other two can get filled up. With the excavated earth, bunds should be raised around the sides of the trenches, as this will prevent rainwater from rushing in and also help to increase the effective volume of the trenches.

(2) *Collection of refuse and urine.*—Special efforts should be made to conserve the urine and collect same for mixing with the other refuses. Cattle urine contains up to 1 per cent. nitrogen and as such the total amount voided by one animal will give 1 lb. of nitrogen in ten days. The nitrogen represented in the urine of 10 animals excreted over a period of say one year, will represent about 400 lbs. which corresponds to the nitrogen content of nearly one ton of ammonium sulphate. The urine of cattle contain appreciable quantities (up to 1·4%) of manurially useful potash also. Enough dry litter may be used as cattle bedding to facilitate absorption of the urine. In addition to this, thin layers of dry earth should be put over the drains and urine soak pit which should be scraped out regularly, the urine earth mixed with the inedible wastes and dung and added to the manure trench.

(3) *Sectional Trench filling.*—The filling of the trench is commenced by taking the first three feet length from the shallower end. Split bamboos knitted together and fixed vertically can mark this distance from the end. The day's collection of dung, litter, cattle bedding and urine mixed together, is dumped loosely within the 3 feet space in trench and levelled up on top. The top is covered over with a thin layer (about 1 inch) of dry earth or urine earth scraped from the cattle-shed. Succeeding days' collections of cattle refuse is deposited over the previous day's lot, levelled up and covered with a thin layer of earth as before. This is continued till the top level rises about 1 to 1½ feet above ground level and may take a week to 10 days depending upon the bulk of refuse materials collected. The top is then smeared over with an inch thick mud plaster. This can be effected easily by spreading a layer of earth, sprinkling with water and smearing with the hand.

The next three feet portion on the vacant side is taken up and the filling continued as before, so that the heaps are raised in sections of about 3 feet at a time and the whole length of the trench is filled. If after a month or so, the top level sinks below ground level, fresh refuse and dung may be added to raise the level a foot above ground level. This precaution helps to divert the excess rainwater during rains.

The manure need not be given any turnings and usually no waterings are necessary. The manure is ready in about 5 months.

Plastered Heap Method

This method is preferably adopted in places where the water table is high and it is not possible to prevent water from rising up the bottom of trenches. For this purpose, the day's collection of mixed refuses and dung is dumped to form a square heap of about three feet sides, and covered over with a layer of dry or urine soaked earth. Subsequent day's collections are dumped over same and the heap built up to a height of about 4 feet. When this is over, another such small heap is raised by its side, with one side common to both. This heap is also built up to same height. The third and fourth heaps are similarly formed so that one large square heap o about 6 feet sides is formed. The outer sides of the large heap are drawn up to form a dome-shaped mound and plastered with wet earth.

The heap method involves more labour and more earth for plastering than with trenches. No turnings of the heap need be given and the manure would be ready in 4–5 months.

General Hints

(1) Farm manure is usually poor in phosphoric acid and a good method of enriching the manure in this plant food would be to add bone meal or charred bones available on the farm to each layer of refuse in the composting mass.

(2) In the ordinary farms where mixed crops are grown and cattle are maintained, the refuse collected will contain enough dung and urine to give a mixed mass where decomposition will proceed satisfactorily in trenches. However, in cases where the refuse contains comparatively little animal excreta and more of resistant, low nitrogen containing type of vegetable refuse like sugarcane trash, it would be preferable to form overground heaps to provide for more free aeration. The heaps should be given a turning at the end of a month followed by watering or preferably addition of fresh dung and urine to keep up the decomposition process.

(3) In cases where large quantities of a uniform type of rather resistant type of refuse has to be dealt with, like sugarcane trash, which contains a water repelling waxy covering matter, or cotton stalk, which is very fibrous, as much of these refuses as possible should be put through a preliminary process of breaking down under the feet of cattle or under carts or rollers and then mixed with the wastes from the cattle shed. The whole mass should then be composted in heaps arranged in either rectangular forms or in semicircular dome-shaped heaps.

(4) The methods described above possess a number of advantages over the present methods adopted by ryots, in that the heavy losses of nitrogen and organic matter attendant on keeping the mass exposed and subjecting to frequent turnings are

prevented, while the difficulties in watering which involve additional labour are minimised. In the case of the trench method, the manure will be found to take a longer period to mature than when turnings are given, but this disadvantage is not a serious one considering that a considerable percentage loss of nitrogen takes place with each turning. Also over most parts of the State, manure is needed only once in six months, and in many parts, only once in a year, and so the advantages of obtaining a larger quantity of better manure with less labour, would offset the likely disadvantages of the longer period needed to get the matured manure by the above methods. Any greenness that may be noticed in the manure in the lower layers in the trenches is only superficial and not indicative of incomplete decomposition. This mass when turned out of the pits will be found to darken in a brief period and easily become friable.

Handi roga of Ragi (*Eleusine coracana*)

By S. V. Venkatarayan
Mycologist

The ragi crop used to be comparatively free from diseases, but of late, a number of diseases have been noticed on it. The most peculiar of all these, however, goes by the name of *handi roga*, literally disease due to a pig. Just how this name came to be used is a mystery. In India the pig is considered to be one of the basest of animals, and this probably accounts for the origin of the name because this disease appears to be the worst of all. It is a combination of several diseases. In the olden days, diseases of crops were supposed to be due to the anger of Gods or the evil influence of the stars. It is reported that *handi roga* is so-called because a pig is believed to have been buried in a field out of spite. This is on a par with the belief common among Romans, about two thousand years ago, that wheat rust was a curse sent on farmers as the result of the act of a wicked boy, who burned a fox which he caught robbing his father's hen roost.

The disease was reported from Goribidnur taluk in the Kolar district on *kar gidda* ragi, *dodda* ragi, and irrigated ragi. The adverse seasonal conditions of the past year, followed by continuous cropping on lands not sufficiently manured and the excessive rains of this year (1946) might have contributed to the appearance of so many of these diseases simultaneously. Some of the plants are dwarfed, and in some the leaves take on a reddish discolouration. This latter symptom has been known to accompany excessively wet conditions. Some plants showed evidence of mosaic disease, and a fairly large number showed infestation by borers. In some plants fresh shoots were coming up at the sides, and adventitious roots also were developing from the nodes. These might probably be attempts on the part of the plant to counteract the damage done by the borers.

The serious symptoms noticed, however, were those caused by the leaf blight and foot rot fungus, *Helminthosporium nodulosum*, and another fungus, *Sclerotium rolfsii*. These two diseases, particularly the latter, are favoured by high moisture conditions. *Sclerotium rolfsii* forms reproductive bodies looking very much like small ragi grains. These serve to help the fungus to tide over the hot weather. Helminthosporium rot can be controlled by treating the seed before sowing. Nothing can however, be done against a combination of all these diseases, and it is to be hoped that it will not recur, as a combination of such adverse circumstances comes about only very rarely.

Pseudostem rot of Plantain (*Musa sapientum* Linn.)

By N. S. Venkatakrishniah
Senior Assistant Mycologist

Plantain (*Musa sapientum* Linn.) is cultivated in Mysore as a three years' crop on wet, garden and dry lands under irrigation. The most delicious variety " Rasabale " is subject to a rot caused by a fungus known as *Sclerotium rolfsii*. The disease is noticed in parts of Mysore, Bangalore and Tumkur districts. It is locally called " Tharagu mari roga ".

Narasimhan[1] reported the occurrence of the disease in Mysore. Uppal, Patel and Kamat[2] recorded the fungus in Bassein, Bombay on *Musa sapientum* Linn. among other hosts. Infection was observed on isolated plants and in patches in several gardens on plants about 8 months of age resulting in a great loss. The infected plants put on a sickly appearance and retarded growth. The fungus attacks the pseudostem near the ground and advances upwards to a height of 3–4 feet. A longitudinal splitting of the pseudostem at the base as in the Panama disease is also noticed (Fig. 2*a*). Large discoloured patches appear on the leaf sheaths. They enlarge as the infection advances and assume a straw coloured centre with a reddish brown margin. Infection extends from sheath to sheath inwards. This impairs the function of the sheaths and weakens their support to the stem. The leaves lose their dark, green colour, turn yellow, gradually droop and dry up one after another. The fungus is readily made out on pulling out the leaf sheaths by the characteristic, fanlike, luxurious growth of the white mycelium (Fig. 1). Numerous, small, dark, round bodies develop on the web of mycelium (Fig. 3*b*). These are at first white and later take on the colour and size of ragi grains (Fig. 4). These are hard durable bodies which are known as Sclerotia, and serve to reproduce the fungus.

The fungus was brought into pure culture from the diseased leaf sheaths obtained from a garden near Mysore. Sclerotia and mycelia picked aseptically from infected sheaths were placed on oat and potato dextrose agars in petri dishes. The fungus grew rapidly on ordinary laboratory media such as oat, onion and potato dextrose agars and formed abundant sclerotia. Healthy plants of " rasabale " variety raised in pots in the laboratory were inoculated with pure cultures of the fungus. Sclerotia and

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[1] Narasimhan, M. J., *Admin. Rept. Agri. Dept.*, Mysore, 1934–35, 19–20.

[2] Uppal, B. N., Patel, M. K., and Kamat, M. N., *The Fungi of Bombay*, Bull. No. 176, 1934, 33–34.

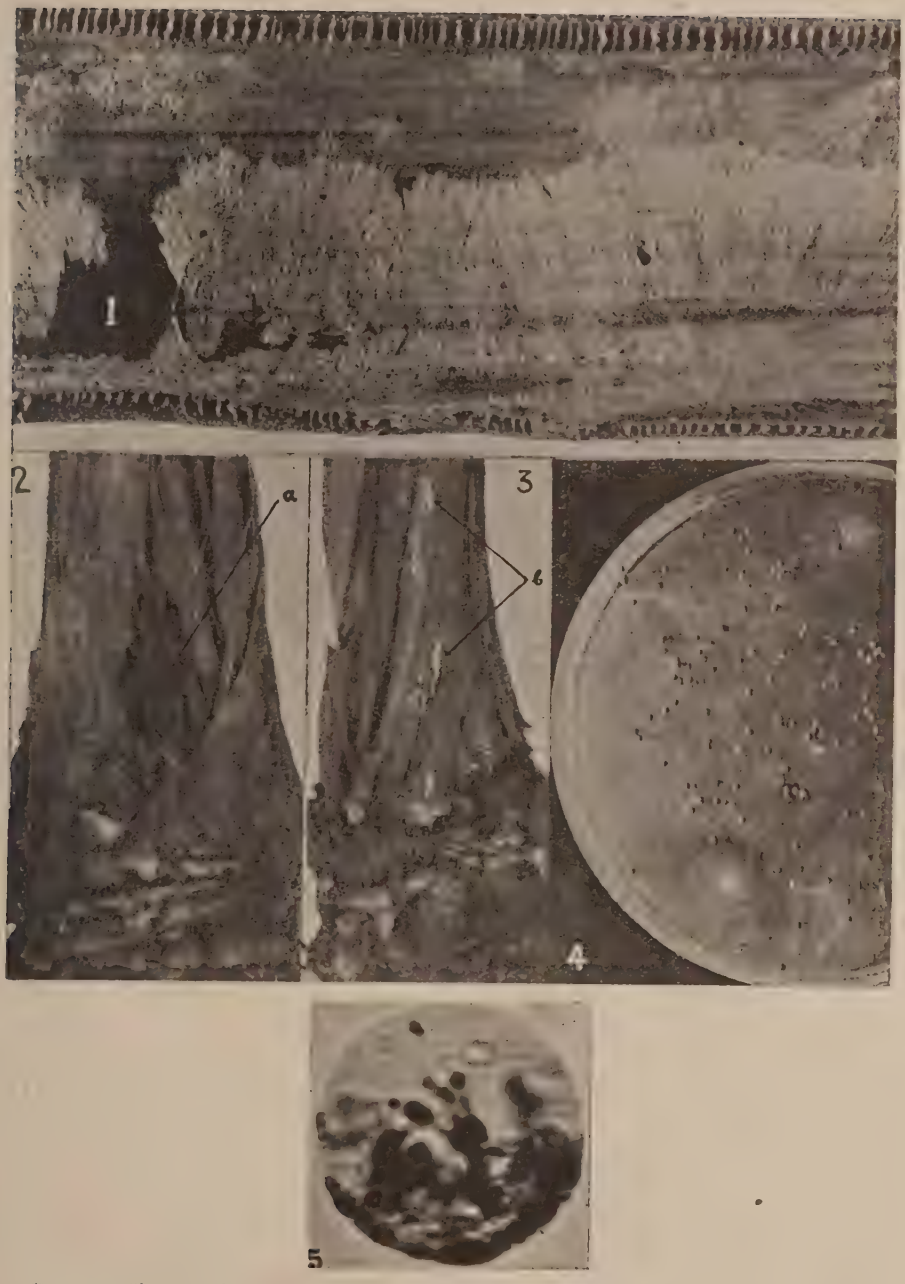

FIG. 1. Characteristic growth of the fungus on the leaf sheath.
FIG. 2. Infected pseudostem showing longitudinal splitting.
FIG. 3. Infected pseudostem showing the formation of sclerotia.
FIG. 4. Fully developed sclerotia in culture.
FIG. 5. Microphotograph of basidiospores.

mycelia placed within the leaf sheaths developed hyphæ and the leaf sheaths turned the characteristic reddish discolouration in about a month. Venkatakrishniah[3] observed in the laboratory that the fungus develops also minute spores, *viz.*, basidiospores (Fig. 5) which are probably found on the infected plants as well as in the field. These serve to spread the infection rapidly whereas the sclerotia carry the infection from year to year tiding over unfavourable climatic conditions. The sclerotia are also found on the soil. They detach themselves easily from the mycelium and drop to the ground in great numbers. They remain viable for a long time. They put forth fresh mycelium on the return of favourable climatic conditions and infect healthy plants. They are carried with the soil or on the infected portions of plants and thus serve to spread the infection from plant to plant.

It is easy to control the disease if precautionary measures are taken. Infected gardens where the soil is likely to have many sclerotia should be avoided for planting. All the infected leaf sheaths should be removed early and burnt before the sclerotia are shed. Healthy suckers selected from disease-free gardens should be used for planting. Application of Bordeaux paste (1–2–1½) to the base of the pseudostem is found to be effective in controlling the disease. Bordeaux paste is prepared as follows: One pound copper sulphate is dissolved in three seers of water in an earthen, wooden or copper vessel. Two pounds good, well burnt stone lime is slaked slowly by sprinkling first with a little quantity of water and then adding the remaining quantity of water to make up three seers of lime solution. The copper sulphate solution is slowly added to the lime solution and the whole stirred vigorously. The resulting paste which is of a sky blue colour and of the consistency of a thick white wash is swabbed on to the pseudostems to a height of 3–4 feet from the ground by means of a brush. One pound of copper sulphate will suffice for treating 100 plants. The cost of treatment would not exceed one quarter of an anna per plant even under the present increased cost of chemicals and labour.

The writer is greatly indebted to Mr. S. V. Venkatarayan, Mycologist, for helpful suggestions.

[3] Venkatakrishniah, N. S., *Curr. Sci.*, Sept. 1946, **15**, 259.

A Calendar of Mysore Agriculture

(The local year is from April to March)

APRIL

Dry Lands

On dry lands when carting manure, cart also the soil from the beds of tanks which are usually dry at this time of the year, for the silt will both improve and enrich the soil. On receipt of sufficient rain plough the land once. Apply two maunds—56 lbs. of bone meal or superphosphate per acre and sow in 20 seers per acre of mixture of equal quantity sann-hemp, cow-pea and horse gram. The crop of green manure may be ploughed in at the time of preparing the land for monsoon crop in the usual manner.

Paddy and Ragi

Ragi and paddy which have ripened early may now be harvested and the seed of green manures sown in the land thus released. The seeds may be sown just after the first showers or under irrigation.

Bee-keeping

If the colony of bees in the decoy hive has had a fair start, it may be transferred into an improved hive kept in a suitable shady place.

Colonies located in tree trunks may be transferred into box hives.

Coffee

Coffee is subject to the ravages of three important fungus diseases, namely: (i) Rust or leaf disease which was responsible for wiping out the Ceylon coffee industry, (ii) Black rot or Koleroga common in the higher elevations, and (iii) die-back. For all these diseases, spraying with Bordeaux mixture has been found to be successful. The spraying should be done before the south-west monsoon and sometimes it is necessary also to attempt a post-monsoon spraying. The time to start spraying depends on the extent of estate to be sprayed, not earlier than April and not later than May. The Department of Agriculture issues spraying materials and sprayers on short credit, free of interest.

Arecanut

Areca garden owners should arrange to build areca driers. It will mean better quality of nuts than in drying over an open fire and greater convenience in working. Agricultural Inspectors will render all possible aid in constructing such driers.

Kar-Ragi

Light earthing operation should be carried out twice (at the interval of two weeks) in young *Kar*-Ragi fields just after transplantation, to prevent the stem-borer pest from damaging the crop.

Drying central shoot, due to stem borer attack should be removed along with roots as soon as noticed and destroyed by burning.

Grape Vine Powdery Mildew

The powdery mildew of the grape vine appears about this time on the leaves and bunches. It is best controlled by a dusting with fine flowers of sulphur. This disease is different from the downy mildew appearing about August-September.

MAY

Dry Lands

On fields ploughed after the previous harvest, sow in the Bharani rains the early mungar crops, *viz.*, gingelly, jola, greengram, blackgram or groundnut which can be followed in the months of September or October by a second crop, wide apart *i.e.*, one foot, so as to make interculture easy later on.

Wet Lands

On wet lands sow a green manure crop, such as sannhemp (30 seers to the acre) or sannhemp and cow-pea; this will be ready for being ploughed in puddle-sown paddy land in July.

Garden Lands

On garden land under well irrigation, potatoes, onions and turmeric can now be planted.

Kamblihulas

Wherever in the districts of Chitaldrug and Simoga there was an attack of 'Kamblihulas' in the previous year all the ryots of the locality should go round their fields from now on to the middle of July to catch the conspicuous white moths. All the moths picked must be put into a mixture of kerosene oil and water and killed.

Bee-keeping

If the bee colony is rapidly growing bigger and the brood chamber getting full, with bees in all stages, a super (with wax foundation fixed to frames if available) should be placed on top of the brood for storage of surplus honey.

Arecanut

The areca gardens of the malnad suffer from the effects of Koleroga. The affected nuts drop down. Sometimes the affected trees are also killed. The best thing to do is to spray the bunches before the rains of the south-west monsoon with Bordeaux mixture. If the spraying is done timely and well the disease does not appear, but if not done well a second spraying may be necessary about the month of August-September. The Department of Agriculture issues sprayers and spraying materials on short credit free of interest. Spraying is crop insurance.

Tobacco

Tobacco is subject to damage by the damping-off fungus. As a precaution against this the nursery beds must be sprinkled with half per cent. Bordeaux mixture. This treatment might also minimise infection by Leaf Spot Disease. After transplantation of the seedlings, when the plants have developed a few leaves, the basal leaves should be picked off to prevent mildew and if it should appear spraying with Bordeaux mixture ensures control. Be on the look out for dwarfed or crinkly or mottled plants, and pull them out immediately as they harbour a virus, a very serious trouble in tobacco. At the end of the season, the roots should all be pulled out as their remains will help to carry over the virus to the next season.

Kar-Ragi

Light-earthing operation and removal and destruction of dying and dead central shoots should be carried out to control the stem borer.

JUNE

Dry Lands

The south-west monsoon begins in this month, and it is really the season for preparing land for sowing. Nearly all the fields remain untouched. Baking and hardening through the hot months, and only the heavy showers of this month can moisten them sufficiently well to plough. Fields however, which were given the first ploughing in the previous month should be cross-ploughed now, so as to kill the seeds which may have sprouted in the interval. In preparation of the soil for sowing, the point to remember is the great saving in time and money which can be effected by the use of the improved implements such as the improved or the mould-board plough, the six showel cultivator, the disc harrow and the *dodda kunte*. All these implements can be seen in the Government Experimental Farms. They are stocked and sold by the Agricultural Department, and can be had in the Central Implement Depot in Bangalore and in the Depots of the Agricultural Inspectors in the Ranges.

On fields got ready for sowing, main crops of jola, Dharwar-American cotton, groundnut and dry land paddy may be sown. Where paddy is grown by transplanting seedlings from nurseries. Paddy should be sown in rabbed nurseries. It gives vigorous seedlings.

'Kamblihulas' and Grasshoppers

In all villages affected by the Kamblihula, ryots should look for the moths that will emerge after heavy showers. These moths will have to be handpicked and killed if ryots want to avoid attack on their fields by this pests.

After the *mungar* rains the paddy grasshoppers emerge on the bunds. They cannot jump long distances then and are easily caught by sweeping large bags of cotton cloth over the bunds. Enormous numbers can be caught in this way. They are then crushed or thrown into water to which has been added a little kerosene. All the ryots in the village should co-operate. The bags should be 5 feet long and 2 feet by 4 feet at the mouth. The opening is supported at the sides by two sticks 3 feet each and two men sweep the bunds at a run.

Bee-keeping

If the super provided in May has been half to three-fourths full with honey, a second super may be provided. If the place is exceptionally rich in honey-yielding plants, a good crop of honey may be stored and this should be extracted.

Jola-smut

The jola crop suffers from smut or *kadige roga*. This disease can be successfully controlled by steeping the seeds before sowing in a solution of copper sulphate. Packets of copper sulphate each enough to treat seed for about 10 acres are available for a small cost at all agricultural depots. The packets contain directions for treatment.

Jola-earhead Bug, Fly and Caterpillar

A deep watch should be kept for the appearance of these pests in the tender and forming earheads of jola; immediately some of these pests are noticed, the earheads should be well dusted with a mixture of equal parts of finely powdered tobacco and washing soap.

JULY

Dry Lands

Nearly all the main crops of the year, *viz*., ragi, jola, groundnut, *sajje*, *save*, *haraka* with their subordinate *akkadi* crops are sown in this month.

Paddy

On wet lands, paddy is sown in puddle if water is available, or it should be sown in a dry (not irrigated or puddled) seed-bed. It is advisable to plough in 3,000 lbs. of green manure per acre, three weeks before transplanting and about 4–5 cart-loads of farmyard manure two weeks before. It also pays to use artificial manures for paddy. Use a mixture of 4 mds. groundnut cake, two maunds of ammonium sulphate and 2 maunds of superphosphate or bone meal per acre just at the time of transplanting.

Ragi

H 22 is a high yielder both in grain and straw. It is now grown on thousands of acres in the Mysore State and also in some parts of the Madras Presidency. Try its suitability to your tract. Other good strains like K-1 can also be had on application to the Department of Agriculture.

Chillies and Tobacco

During the first half of this month, chillies and tobacco intended to be raised as dry crops should be sown in nursery beds so as to have seedlings for transplanting about the end of the next month.

Pepper

In the malnad this is the month for layering pepper for propagation. Select the best hermaphrodite vines in the garden for the purpose.

Insects

Coffee stem borer.—Borer infested coffee bushes in the coffee estates should be systematically removed during this month and the next month.

Those who are troubled with ground grubs damaging sugarcane should get coolies to look for the young ones which will be found often below the soil surface. If these are picked off and destroyed, no trouble will arise later and canes will be safe.

The red headed Kamblihula moths begin to emerge in the ploughed fields during the middle of the month, in parts of Kolar District. The ryots and their children should regularly pick out the moths in the early hours of the morning and evening and destroy them by putting them in a pot containing kerosined water.

Jola grasshoppers hatch out during the end of this month. They must be bagged from the bunds and destroyed.

Bee-keeping

Any capped honey may be extracted; it is wise to leave some quantity un-extracted, to serve as an emergency stock, during the monsoon months.

Potatoes

Potatoes suffer commonly from a disease known locally as "*madiga roga*". It is also called early blight. Spraying with calcium arsenate solution (1 lb. in 50 gallons of water) with lime caseinate as a spreader protects the plants. This is a preventive also against the Epilachna beetle. Spray when the crop is about a month old and a second time after an interval of 3 to 4 weeks.

Apple Root Rot

To prevent the spread of this disease all dead and dying plants must be removed root and branch, and burnt to destroy the resting bodies of the fungus. The main root of the healthy plants may then be exposed 9" all round the plant and sprayed with Bordeaux mixture, after which the roots may be covered with the soil.

Jola Earhead Pests

Wherever these pests have appeared the operation of dusting earheads with the tobacco and soap in powder form should be carried out.

Kumkumaroga of Jola

As soon as jola leafblades show red spot and patches, the blades should lie dusted with a mixture of finely powdered sulphur (1 part) and fine wood-ash (4 parts). Badly damaged leaf blades should be recovered and destroyed by burning.

AUGUST

Interculture

A busy month for interculturing the main crops. It is well to note that for cultivating between the rows, the small *kunte* with an entire blade—a miniature *dodda kunte* is—an excellent implement, as it works the whole of the space between the rows. Labour can be economised by using two or three of these with one team.

Cotton

On black cotton soils, the main crop of local cotton (*Sannahatti*) with its mixture of *navane* should be sown about the middle of this month. The improved strain called Selection 69 is the best to grow; it is a superior cotton and gives a higher money return.

Chillies and Tobacco

On fields kept repeatedly ploughed, harrowed and weeded during the past three months, chillies should be transplanted; so should tobacco, the transplanting of which may be continued from about the latter part of this month to the middle of the next.

Garden Lands

On garden lands under well irrigation, the main rainy season grain crop of ragi may be transplanted.

Lime Tree Borer

The lime tree borer will be found in this month in small twigs, dry because they are girdled by them. These twigs have to be broken off with the aid of a forked stick if the trees are to be prevented from danger by the borer. The borers fall down to the ground from the broken ends and die.

Potato

Potato crop should be sprayed with solution of calcium arsenate for destroying the Epilachna beette.

Bee-keeping

Regular weekly cleaning of the bee-hive should be done to prevent the wax-moth from breeding inside.

Jola Grasshopper

The young ones of jola grasshopper should be bagged during this month also.

Grapevine Downy Mildew

Grapevines are attacked by downy mildew during the North-East monsoon and very soon afterwards also by rust. As a preventive against diseases the vines may be sprayed with Bordeaux mixture. Three sprayings may be necessary, the first to be done when the shoots are 6 to 8 inches long, the second just after blossoming and the third before the fruit changes colour.

Jola Earhead Pests

Whenever these pests have appeared the operation of dusting earheads with the mixture of tobacco and soap in powder form should be carried out.

Kumkumaroga of Jola

As soon as Jola leaf blades show red spot and patches, the blades should be dusted with a mixture of finely powdered sulphur (1 part) and fine wood-ash (4 parts). Badly damaged leaf blades should be recovered and destroyed by burning.

SEPTEMBER

Dry Lands

The early *mungar* crops sown in the *bharani* rains will be ready for harvest towards the latter part of the month; after harvest, plough these lands and prepare them for a second crop of horse-gram, cow-pea or avare as suggested under May. In

black cotton soils or dry tank beds and bunded fields wheat or bengal gram may be sown.

Fodder and Cattle

It should be noted that from this month onwards till the close of the year green fodder is in full flush. The manure, principally the urine from the animals, is very valuable during this period, much more so than during the hot months or early rains when all animals, excepting those in milk or working bullocks are practically on starvation rations. Special care should be taken to see that all the urine from the stalls finds its way into the manure pit.

Wet Lands

Towards the end of this month, on well-drained wet lands and garden lands Cambodia cotton may be sown: but this does not yield as much crop as that sown in May or June.

Paddy Pests

Paddy is liable to be attacked by stem borer from this month up to November. The plants attacked will have the shoots withered. The caterpillars turn into moths. The moths lay eggs in masses, covered by golden hairs on the leaves. These are easily seen and should be handpicked and destroyed. Light traps (hurricane lanterns placed hanging over a basin with a little water and kerosene) kept in the field at a height of 4 ft. from the ground will attract and kill the moths.

Coffee Stem-borer

Borer-infested coffee plants in the estates should be completely burnt by the middle of this month. This will reduce the borer incidence during the next two months.

Bee-keeping

Any capped honey available, over and above the needs of the colony during this comparatively inactive season may be extracted. Regular cleaning should be continued.

Mildew on Peas

The pea crop suffers very badly from mildew, which covers the leaves like an ashy bloom. To prevent this spray early with 1 per cent. Bordeaux mixture and oil as adhesive or dust with flowers of sulphur, when the crop is about a month and a half old.

Black-headed *Kamblihula*

This pest of castor, ragi, jola and other crops is found in its early stage or a small caterpillar, congregating in large numbers on the lower surface of castor and other leaves in the backyards

of houses, inteilas, etc., such leaves should be removed and destroyed along with the caterpillar.

Paddy Beetle Pest

This green blue beetle, appearing on young in the malnad areas should be controlled by ' kerosene treatment'.

Case-worm of Paddy (*Kokkare Roga*)

Kerosene treatment should be promptly carried out wherever this pest appears.

OCTOBER

Crops

The month for the sowing of the *hingar* crops, such as *hingar* jola, the various grams, coriander, wheat, cheap grains like *baragu* or *save*, etc., on dry lands in Chitaldrug, Shimoga, and generally the northern part of the State.

Wet and Garden Lands

On wet and garden lands, potatoes, Cambodia cotton and the various garden crops can be sown.

Sugarcane

In some parts of the State, this is also one of the seasons for planting of sugarcane; this is done under tanks which are known to get very good supplies almost unfailingly during the heavy *hasta* and *chitta* rains of this month, which will carry the crop through the hot months, when the cane will be in full growth and would require heavy irrigation. This planting has the advantage of enabling the ryot to mill cane long before the general milling season begins, and to put jaggery on the market when prices rule high—(*vide* notes under January, *re* seed sets for planting).

Avare (*Dolichos lablab*) Pod Borer

Look for avare pod borer of which a few caterpillars will be found on the fresh few flower spikes that will appear this month. If they are gathered and killed, the subsequent generations will be prevented. Whitish round eggs are found in large numbers on young pods and flowers. These will have to be rubbed off. Children can be trained to do this work. See circular on avare pod borer, copy of which can be had free.

Coffee Stem-borer

The stems of coffee plants in estates where the coffee stem-borer is bad should be swabbed with any one of the ovicidal washes during this month. Attention to scrubbing of the stems of coffee should also be paid to reduce the borer trouble.

Bee-keeping

Regular cleaning of the bee-hive should be continued.

Paddy Beetle Pest

This green blue beetle appearing on young in the malnad areas should be controlled by ' kerosene treatment '.

Case-worm of Paddy (*Kokkare Roga*)

Kerosene treatment should be promptly carried out wherever this pest appears.

NOVEMBER

Ragi

A few days before harvesting ragi, go over the field and select and harvest all ear-heads which are large in size and have good number of spikes. Dry and thresh them separately and preserve carefully for seed. This seed will give you plants with large ear-heads with many spikes and hence, a much bigger yield than unselected seed.

Sugarcane

On wet lands reserved and being prepared for sugarcane, green manure crops can be sown. Applications for seed setts should be made early.

Cotton

Dharwar-American cotton (*Doddahatti*) sown in May-June will be ready for a first picking; and in picking, care should be exercised, as mentioned in the notes under March. The best plants *i.e.*, those bearing profusely should be marked down too, and their cotton should be picked and stored separately. This should later be ginned at home and the seed preserved for sowing next season.

Fodder

Jola raised for fodder and green grass in the jungles will be in condition for making ensilage, and every cattle owner should arrange for this method of storage.

Avare Pod Borer

Rubbing off eggs and caterpillars of the avare pod borer have to be done this month also. See notes for previous month.

Coffee

As soon as the rains cease, spraying against green bug on coffee should be commenced on all infected estates and continued until the picking season. They will be observed only on a few trees to begin with, and if these are sprayed, the severity of infestation will be considerably reduced. The infestation will start

with an ant's nest in the ground or on the tree as a centre. Spraying should be continued after the rains until the monsoon sets in.

Bee-keeping

Good care of the bee colony should be taken; wax-moth should not be allowed to breed in the hive; the entrance into the hive should be reduced much in the case of a weak colony to prevent the wax-moth trouble as there is some possibility of the colony dwindling in numbers during this month and the next. Sugar syrup or dilute honey or combs with capped honey should be supplied if found necessary; every effort is to be made to keep the colony fairly strong.

Case-worm of Paddy (*Kokkare Roga*)

Kerosene treatment should be promptly carried out wherever this pest appears.

DECEMBER

Dry Lands

Soon after the dry crop of ragi or jola is harvested, the field should be ploughed up immediately. In this way, the moisture in the lower layers of the soil will be protected from the drying action of the sun and wind. The soil will be in a fit condition to receive and soak up the early rains of April and May, and thereby to enable us to start mungar ploughing early, or sow an early mungar crop like those specified in the notes under May. The soil will weather well, which as many ryots know, is equivalent to applying manure, the roots of weeds will be killed, and the pupæ of insects destroyed.

This ploughing is a very important operation for dry lands, for in a year of poor rainfall, it will help to tide the crop over the drought. It should therefore be attempted notwithstanding difficulties, such as the presence of the akkadi or subordinate crop, the hardness of the soil, etc. Immediately after harvest, the soil will be moist enough to plough or disc, and, at that time, it will be also possible to dodge the rows of the mixed crop in ploughing.

Seed Storage

From this month onwards, grains, pulses, etc., will be put in store. See all are thoroughly sun-dried before storage. Store preferably in tins with narrow mouths. When the grains and pulses are well settled down treat as follows: In the case of pulses, put on top a layer of sand 1 inch thick; weevils emerging from the pulses will come through the sand but will fail to return and so fail to reproduce. In the case of paddy, use a mixture of chunam powder and sand, half and half. In both cases, there should be an opening at the side down below for withdrawal from time to

time. When the grains and pulses are so withdrawn, the top layer of sand or sand and chunam is likely to be disturbed. See that it is set right each time.

Potato

Materials for spraying potato against its pests and diseases must have been brought by now and crop be sprayed in time (*vide* Notes under July).

JANUARY

Paddy

Where tanks have received a good supply of water in the rains of the North-east monsoon and on lands under well irrigation the fields will soon be sown with Vaishakhi or summer paddy. Transplant your paddy in preference to sowing broadcast. Considerable saving in seed can be effected especially if the seedlings are planted in two's or three's rather than in bunches of several seedlings. The water in the tanks, which in the coming dry weather is liable to much loss by evaporation, can be used economically by this method. Where water has to be raised from great depths, such saving is an important consideration. Transplanting will moreover give a better yield than broadcasting. If seeds are sown in the nursery at the beginning, the seedling will be ready at the end of this month for transplanting. The fields should be manured before transplanting. For special manures for paddy, consult the Agricultural Inspector in your place.

Ragi

Nursery plots for irrigated ragi are prepared in this month and seeds sown. Nursery beds should be rabbed wherever possible on the renovating crop give more grain or strand.

Jola

Sow *bilijola* on black cotton soil, in tank beds with no water in them and under tanks with limited supplies of water so as to have good fodder for cattle during the dry months.

Mango

Mango trees flower about the middle of this month. Look for mango hoppers on the flower-spikes and spray them with a solution of Hongey oil soap made by mixing 1 lb. of the soap in ten gallons of water.

Sugarcane

Sugarcane is planted during this month. Among the indigenous varieties the pattapatti sugarcane is a very superior local cane both in yield and quantity of sugar present in the juice. But new varieties which are more vigorous and better yielding are now available. These are H.M. 320, H.M. 553, Babbur striped

(H.M. 544 striped), H.M. 606, H.M. 607, H.M. 613 Co. 281 and Co. 290. Among the more recently evolved canes H.M. 661 and H.M. 647 are showing great promise. Some of these arrow from September to January. These should be planted before the end of February. Application for seed setts should be made to the Assistant Director of Agriculture of the Division concerned. In selecting seed setts care should be exercised to avoid mosaic infected canes which can be recognised by the mottled leaves and by the barrelled internodes. It is best to avoid the whole infected clump.

Ryots who grow Sugarcane should lay in a good supply of both organic manures and artificial fertilizers as sugarcane responds well to manuring. Of organic manures, 10 cart loads of farmyard manure or 3 to 5 tons of compost from habitation or agricultural waste may be used with advantage. A crop of cow-pea or sunnhemp grown and ploughed under would be of great benefit. As regards artificials, 1 cwt. of concentrated super-phosphate and 500 to 800 lbs. ammonium sulphate may be used. Consult the Agricultural Chemist, Bangalore, or your nearest Agricultural Officer regarding the quantity and the time of application of these different manures.

FEBRUARY

Threshing

In making preparations for threshing, it is well to remember that this slow and tedious work can be done more quickly and with less trouble and worry by adopting better methods than those commonly employed. Firstly, a stone threshing roller 2½′ long by 2′ high of the kind now coming into use in many parts of the State, is a very good appliance and is all within the means of the ordinary ryots. It does the work quicker and with less labour, and can be used for threshing ragi, jola, *avare*, *togari* or *hurali*.

Paddy and Ragi

If the seedlings are ready in the nursery, paddy can be trans-planted early this month. Irrigated ragi may also be trans-planted similarly.

Potato

Potato crops should be sprayed with calcium arsenate solution to kill Epilachna beetle pest (*Gulaganji-hula*).

Bee-keeping

Those interested in Bee-keeping should arrange to get a couple of earthen pots or date palm stem decoy hives to keep them tied up in suitable places—in garden or jungles or bungalow compounds—for attracting swarms that begin to move about now.

Sugarcane

During this month also sugarcane is planted. In the case of young planted sugarcane, three weeks old, earthing up and irrigation should be carried on twice at an interval of about two weeks, to control the borers. This operation should be carried out in newly planted young canes until the planting season is over. Milling is also continued during this month.

Note that with the same amount of cane, a bigger money return can be obtained by the use of better mills which extract more juice and light coloured jaggery, fetching a higher price can be got.

Use the Nahan or Madurai bullock mill, or if possible an engine driven mill for milling. Use red litmus paper to judge liming and good skimming laddle to remove scum thoroughly.

MARCH

Sugarcane

During this month also cane can be milled and planted.

Cotton

On dry land fields, the bulk of the local variety of cotton will be picked. It will pay to pick cotton clean and also to pick good cotton separately from worm-eaten, stained or otherwise dirty cotton.

Garden Lands

On garden lands, *i.e.*, under well cultivation minor vegetable crops like beans, cucumber, maize, etc., can be now put in which will be removed in time to prepare and get the land ready for the main rainy season crop of irrigated ragi, chillies, or potatoes.

Bee-keeping

If a colony of bees has settled in the pot or decoy hive, it should be left undisturbed till such time as a few combs are built and eggs and young ones begin to appear.

Intending bee-keepers may also locate fairly well established colonies in the hollows of trunks and big branches of avenue and plantation and jungle trees, in order that the colonies may be transferred into box hives during the month of April or May.

Jola

Early sowing is preferable to late sowing since the former prevents the spread and multiplication of the jola earhead pests later in the season.

804-47 Printed at The Bangalore Press Bangalore City, by G. Srinivasa Rao, Superintendent